Allen-Bradley

PowerFlex® Communications

Serial Converter Module

22-SCM-232
FRN 2.xxx

User Manual

Rockwell Automation

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. "*Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls*" (Publication SGI-1.1 available from your local Rockwell Automation Sales Office or online at **http://www.ab.com/manuals/gi**) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc. is prohibited.

Throughout this manual we use notes to make you aware of safety considerations.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is especially important for successful application and understanding of the product.

Shock Hazard labels may be located on or inside the drive to alert people that dangerous voltage may be present.

Allen-Bradley, ControlFLASH, DPI, DSI, DriveExplorer, DriveExecutive, MicroLogix, SLC, PLC-5, ControlLogix, and CompactLogix are trademarks of Rockwell Automation, Inc.

PowerFlex® is a registered trademark of Rockwell Automation, Inc.

RSLogix is a trademark of Rockwell Software.

Windows, Windows CE, Windows NT, Windows ME, Windows 2000, Windows XP, and Microsoft are either registered trademarks or trademarks of Microsoft Corporation.

This is the second release of the 22-SCM-232 serial converter module (FRN 2.xxx).

Location	Description of Changes
Chapter 4	Added (before old Chapter 4 - Troubleshooting) to describe how to use 22-SCM-232 module with Allen-Bradley controllers to control and read/write data to PowerFlex® 4 and 40 drives.
Chapter 5	Was Chapter 4 - renumbered to 5.
Appendix D	Added to describe MicroLogix 1000 example ladder program.
Appendix E	Added to describe MicroLogix 1200/1500 example ladder program.
Appendix F	Added to describe SLC example ladder program.
Appendix G	Added to describe PLC example ladder program.
Appendix H	Added to describe ControlLogix example ladder program.
Appendix I	Added to describe the Logic Command/Logic Status words that are used for PowerFlex 4 and 40 drives.

Notes:

Table of Contents

Preface **About This Manual**

Related Documentation P-1
Conventions Used in this Manual P-1
Rockwell Automation Support. P-2

Chapter 1 **Getting Started**

Components 1-1
Features 1-2
Compatible Products 1-2
Required Equipment 1-3
Safety Precautions 1-4
Quick Start 1-5
Modes of Operation 1-6

Chapter 2 **Installing the Serial Converter Module**

Selecting Cables. 2-1
Installing the Serial Converter Module 2-2
Removing the Serial Converter Module. 2-3

Chapter 3 **Configuring the Serial Converter Module**

Configuration Tools 3-1
Using DriveExplorer 3-2
Using Terminal Emulation Software 3-3
Setting the RS-232 Serial Port Rate. 3-7
Setting the Fault Action 3-8
Resetting the Serial Converter Module 3-9

Chapter 4 **Controlling PowerFlex 4 and 40 Drives with Allen-Bradley Controllers**

Controller Compatibility 4-1
Cabling Requirements 4-2
Messaging (MSG Instruction) 4-3
PowerFlex 4 and 40 Memory Addressing 4-4
Example Controller Programs 4-4

Chapter 5 **Troubleshooting**

Understanding the Status Indicators 5-1
Module Diagnostic Items. 5-3
Viewing and Clearing the Event Queue. 5-3
Viewing and Clearing DF1 Communication Statistics 5-5
Troubleshooting Potential Problems 5-6

Appendix A Specifications
Communications A-1
Electrical A-1
Mechanical A-1
Environmental A-2
Agency Certification A-2

Appendix B Serial Converter Module Parameters
Parameter List B-1

Appendix C Flash Updates
Preparing for a Flash Update C-1
Performing a Flash Update with HyperTerminal C-2
Troubleshooting Potential HyperTerminal Flash Problems . . C-3
Performing a Flash Update with DriveExplorer C-4

Appendix D MicroLogix 1000 Example Ladder Program

Appendix E MicroLogix 1200/1500 Example Ladder Program

Appendix F SLC Example Ladder Program

Appendix G PLC-5 Example Ladder Program

Appendix H ControlLogix/CompactLogix Example Ladder Program

Appendix I Logic Command/Status Words
PowerFlex 4 and PowerFlex 40 Drives I-1

Glossary

Index

About This Manual

Read this preface to become familiar with the rest of the manual.

Topic	Page
Related Documentation	P-1
Conventions Used in this Manual	P-1
Rockwell Automation Support	P-2

Related Documentation

For Information On:	Refer to:	Publication
DF1 Protocol	*DF1 Protocol and Command Set Reference manual*	1770-6.5.16
DriveExplorer™	*DriveExplorer Getting Results Manual* Online help (installed with the software)	9306-GR001…
DriveTools 2000™	http://www.ab.com/drives/drivetools_2000	

Documentation can be obtained online at http://www.ab.com/manuals

Conventions Used in this Manual

The following conventions are used throughout this manual:

- Parameter names follow the format **Parameter xx - [*]**. The xx represents the parameter number. The * represents the parameter name. For example, **Parameter 01 - [Adapter Cfg]**.
- Menu commands are shown in bold type face and follow the format **Menu > Command**. For example, if you read “Select **File > Open**,” you should click the **File** menu and then click the **Open** command.
- The firmware release is displayed as FRN X.xxx. The “FRN” signifies Firmware Release Number. The “X” is the major release number. The “xxx” is the minor update number.

Rockwell Automation Support

Rockwell Automation, Inc. offers support services worldwide, with over 75 sales/support offices, over 500 authorized distributors, and over 250 authorized systems integrators located through the United States alone. In addition, Rockwell Automation, Inc. representatives are in every major country in the world.

Local Support

Contact your local Rockwell Automation, Inc. representative for:

- Sales and order support.
- Technical training.
- Warranty support.
- Support service agreements.

Technical Assistance

If you need to contact Rockwell Automation, Inc. for technical assistance, please review the information in Chapter 5, Troubleshooting first. If you still have questions, then contact your local Rockwell Automation, Inc. representative.

U.S. Allen-Bradley Drives Technical Support:
E-mail: support@drives.ra.rockwell.com
Tel: (1) 262.512.8176
Fax (1) 262.512.2222
Online: www.ab.com/support/abdrives

UK Customer Support Center:
E-mail: esupport2@ra.rockwell.com
Tel: +44 (0) 870 2411802
Fax: +44 (0) 1908 838804

German Customer Service Center:
E-mail: ragermany-csc@ra.rockwell.com
Tel: +49 (0) 2104 960-630
Fax: +49 (0) 2104 960-501

Getting Started

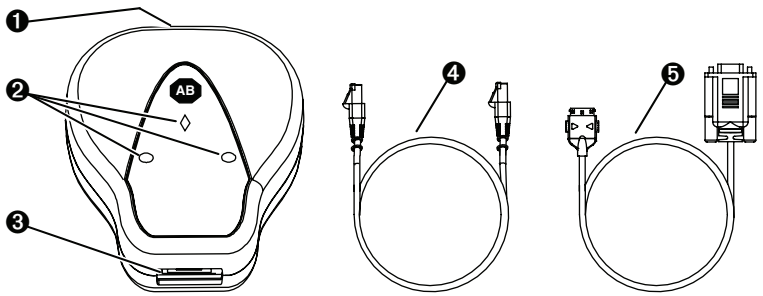
The 22-SCM-232 serial converter provides a communications interface between a computer or controller and any Allen-Bradley product implementing DSI, such as PowerFlex 4 and 40 drives. It uses the full-duplex, RS-232 DF1 protocol.

Topic	Page
Components	1-1
Features	1-2
Compatible Products	1-2
Required Equipment	1-3

Topic	Page
Safety Precautions	1-4
Quick Start	1-5
Modes of Operation	1-6

Components

Figure 1.1 Components of the Serial Converter



#	Part	Description
1	DSI Connection	Standard RJ45 connector. The 22-RJ45CBL-C20 cable is plugged into this connector.
2	Status Indicators	LEDs that indicate module operation, data is being received from and sent to the computer. Refer to Chapter 5, Troubleshooting, for more information.
3	RS-232 Serial Port	Locking low profile connector. The 1203-SFC serial cable is plugged into this connector.
4	22-RJ45CBL-C20 Cable	DSI cable (2 m) with male-to-male RJ45 connectors.
5	1203-SFC Serial Cable	Serial cable (2 m) with a locking low profile connector to connect to the serial converter and a 9-pin sub-miniature D female connector to connect to a computer.
Not Shown	DriveExplorer Lite CD-ROM	CD including DriveExplorer Lite software and documentation.

Features

The 22-SCM-232 serial converter module features the following:

- The serial converter module can connect to products implementing DSI such as PowerFlex 4 and 40 drives.
- Provides a means for DriveExplorer (version 3.01 or higher) and DriveExecutive (version 1.01 or higher) software tools to access PowerFlex 4 and 40 drives.
- Allows various Allen-Bradley controllers, from MicroLogix to ControlLogix, to control and read/write data to PowerFlex 4 and 40 drives.
- Three status indicators (LEDs) report the operating status of the module.
- DF1 serial baud rates of 9600 bps, 19.2 kbps, and 38.4 kbps are supported. The factory default baud rate is 9600 bps.
- The serial converter module receives power from the DSI host product. An outside power source is not needed.
- DriveExplorer (version 3.01 or higher), DriveExecutive (version 1.01 or higher), or terminal emulation software can be used to configure the serial converter.
- The serial converter module is flash upgradeable to take advantage of feature enhancements. For example, version 1.xxx SCM's can be flashed to version 2.xxx (or higher).

Compatible Products

The 22-SMC-232 serial converter module is compatible with Allen-Bradley products that support DSI. At the time of publication, compatible products include:

- PowerFlex 4 drives
- PowerFlex 40 drives

Required Equipment

Equipment Shipped with the Serial Converter Module

When you unpack the serial converter module, verify that the package includes:

- ❑ One 22-SCM-232 Serial Converter Module
- ❑ One 1203-SFC serial cable
- ❑ One 22-RJ45CBL-C20 cable
- ❑ One DriveExplorer Lite CD
- ❑ This manual

User-Supplied Equipment

To configure the serial converter, you must use one of the following:

- ❑ DriveExplorer software (version 3.01 or higher).
- ❑ DriveExecutive software (version 1.01 or higher).
- ❑ Terminal emulation software such as HyperTerminal.
- ❑ VT-100 compatible terminal.

Safety Precautions

Please read the following safety precautions carefully.

ATTENTION: Risk of injury or equipment damage exists. Only personnel familiar with drive and power products and the associated machinery should plan or implement the installation, start-up, configuration, and subsequent maintenance of the product using the serial converter module. Failure to comply may result in injury and/or equipment damage.

ATTENTION: Risk of injury or equipment damage exists. If the serial converter module is transmitting control I/O to the drive (indicated by a solid green diamond LED), the drive may fault when you remove or reset the serial converter module. Determine how your drive will respond before removing or resetting a connected serial converter module.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 04 - [Comm Flt Action]** lets you determine the action of the serial converter module and connected drive if DF1 serial communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a hazard of injury or equipment damage.

Quick Start

This section is designed to help experienced users quickly start using the serial converter module. If you are unsure how to complete a step, refer to the referenced chapter.

Step	Action	Refer to
1	**Review the safety precautions for the serial converter module.**	Throughout This Manual
2	**Install the serial converter module.** Connect a 22-RJ45CBL-C20 cable to the serial converter module and the DSI drive. Then, connect a 1203-SFC serial cable to the serial converter module and a computer. Make sure that power has been applied to the DSI drive.	Chapter 2, Installing the Serial Converter Module
3	**Configure the serial converter module for your application.** Use one of the following to configure parameters in the serial converter module: • DriveExplorer (v3.01 or higher) • DriveTools 2000 (v1.01 or higher) • Terminal emulation software • VT-100 compatible terminal	Chapter 3, Configuring the Serial Converter Module

Figure 1.2 Example Serial Connection to a Personal Computer

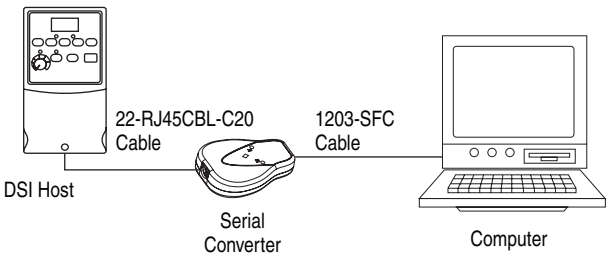


Figure 1.3 Example Serial Connection to a Hand-Held Computer

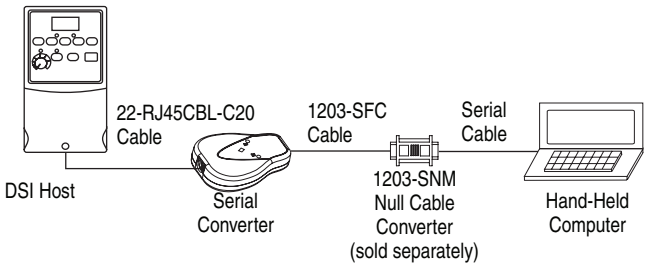
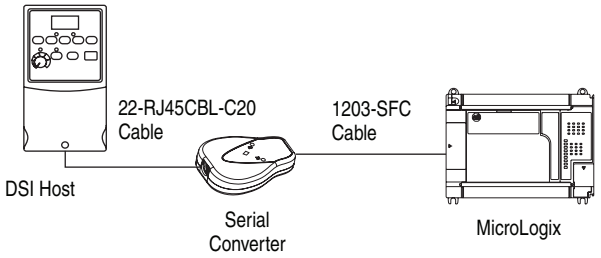
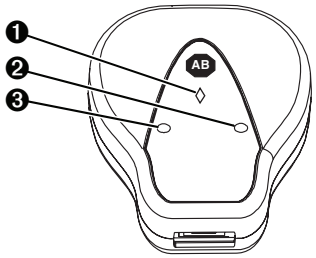


Figure 1.4 Example Serial Connection to a Controller



Modes of Operation

Figure 1.5 Status Indicators on the Serial Converter Module



The serial converter module uses three status indicators to report its operating status (Figure 1.5). The following table describes the state of the status indicators under normal operation:

#	Status Indicator	State	Description
1	Diamond	Flashing Green	Serial converter is connected to a product implementing DSI.
		Solid Green	Serial converter is or was receiving control I/O. Removing or resetting the serial converter may cause a serial fault in the product.
		Off	No power or Flash operation in progress.
2	TX	Off	Not transmitting data.
		Flashing Green	Transmitting data.
3	RX	Off	Not receiving data.
		Flashing Green	Receiving data.

If the diamond status indicator is red, there is a problem. Refer to Chapter 5, Troubleshooting.

Installing the Serial Converter Module

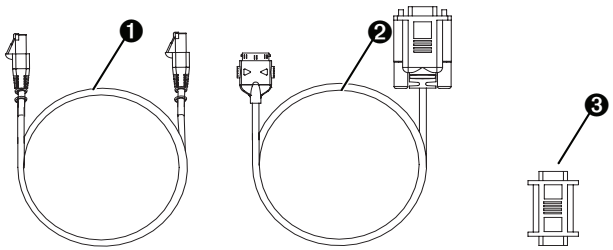
Chapter 2 provides instructions for installing and removing the serial converter module.

Topic	Page
Selecting Cables	2-1
Installing the Serial Converter Module	2-2
Removing the Serial Converter Module	2-3

Selecting Cables

The following cables are all you should need to connect the serial converter module to a drive and a computer.

Figure 2.1 Cables



Number	Description	Catalog Number
1	DSI cable to connect the serial converter module to the drive.	22-RJ45CBL-C20
2	Serial cable to connect the serial converter module to the computer.	1203-SFC
3	When connecting the serial converter module to an H/PC (Hand-Held PC), you must use a null modem cable with two male 9-pin sub-miniature D connectors. These must be purchased separately.	1203-SNM (sold separately)

Important: To provide proper termination of the serial cable shield, the chassis of the computer should be properly grounded. If it is not possible or practical to ground this, then a ground wire

should be connected to the serial cable shield at the shell of the 9-pin sub-miniature D connector.

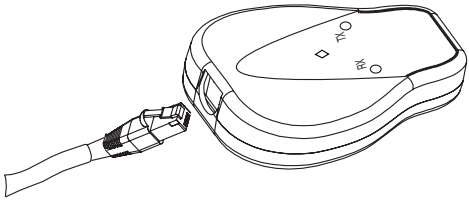
Important: The DSI cable shield must be properly grounded in order to provide EMC protection. On the PowerFlex 4 and 40 drive that means that Pin 16 of the drive control terminal block must be connected to the drive earth ground terminal.

Installing the Serial Converter Module

Important: The module **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the module is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.

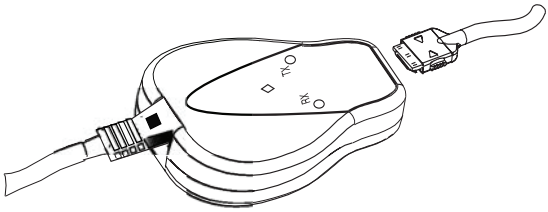
1. Connect the module to the drive using the 22-RJ45CBL-C20 cable.

Figure 2.2 Connecting a 22-RJ45CBL-C20 Cable to the Serial Converter



2. Connect the module to the computer using the 1203-SFC cable.

Figure 2.3 Connecting a 1203-SFC Cable to the Serial Converter



3. Verify that power is applied to the DSI-enabled drive. The serial converter module receives power from the drive, so it must be powered before the serial converter module will operate.

The diamond light on the serial converter module flashes green to indicate that the module is properly installed and receiving power. If it is not green, refer to Chapter 5, Troubleshooting.

Removing the Serial Converter Module

ATTENTION: Risk of injury or equipment damage exists. If the serial converter module is transmitting control I/O to the drive (indicated by a solid green diamond LED), the drive may fault when you remove or reset the serial converter. Determine how your drive will respond before removing or resetting a connected serial converter module.

1. Disconnect the 22-RJ45CBL-C20 cable from the DSI-enabled drive and then from the converter module. To disconnect the cable, press on the cable latch and then pull it out.

2. Disconnect the 1203-SFC serial cable from the serial converter module and then the computer.

Notes:

Configuring the Serial Converter Module

Chapter 3 provides instructions and information for configuring the serial converter module.

Topic	Page
Configuration Tools	3-1
Using DriveExplorer	3-2
Using Terminal Emulation Software	3-3
Setting the RS-232 Serial Port Rate	3-7
Setting the Fault Action	3-8
Resetting the Serial Converter Module	3-9

For a list of parameters, refer to Appendix B, Serial Converter Module Parameters. For definitions of terms in this chapter, refer to the Glossary.

Configuration Tools

The serial converter module stores parameters and other information in its own non-volatile memory. You must, therefore, access the module to view and edit its parameters. The following tools can be used to access the module parameters.

Tool	Refer To
DriveExplorer software (version 3.01 or higher)	page 3-2 in this manual
DriveExecutive software (version 1.01 or higher)	http://www.ab.com/drives/drivetools_2000
Terminal emulation software	page 3-3 in this manual
VT100-compatible terminal	Documentation for the terminal

Important: The RS-485 serial port on DSI products, such as PowerFlex 4 and 40 drives, does not need to be configured before using the serial converter module. DSI communications are configured automatically (19.2K baud and 8-N-1).

Using DriveExplorer

With DriveExplorer software, you can edit parameters in both the serial converter module and the connected DSI-enabled drive. On PowerFlex 4/40 drives (or other DSI products), you can also edit parameters in any of the attached peripherals. DriveExplorer Lite is shipped with the serial converter module and is a free, limited-feature version of DriveExplorer.

Important: **Parameter 1 - [Adapter Cfg]** must be set to "Auto" (default) for DriveExplorer to operate. HyperTerminal can be used if **Parameter 1 - [Adapter Cfg]** needs to be changed (see Using Terminal Emulation Software section).

DriveExplorer Lite Quick Start

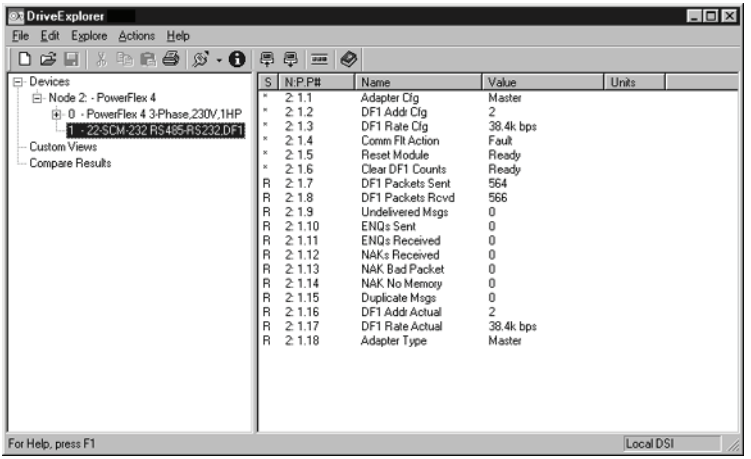
This section is designed to help you quickly start using DriveExplorer Lite. If you are unsure how to complete a step, refer to the online help (select **Help > Help Topics**) or the *DriveExplorer Getting Results Manual*, Publication 9306-5.2, which is included on the CD.

1. Select **Explore > Configure Communication**. Select the communications port and baud rate that you are using. Select either checksum, and accept the default time for the time-out.

2. Select **Explore > Connect > Local**. A node will appear under Devices.

3. In the left pane, click the + signs to expand the tree. Click the product or serial converter module to display parameters in the right pane. Double-click a parameter to edit it.

Figure 3.1 DriveExplorer



Using Terminal Emulation Software

This section provides detailed instructions on how to use terminal emulation software to access the serial converter module so that you can view and edit its parameters or view its event queue.

A variety of terminal emulation programs can be used to establish a serial connection between a computer and the serial converter module. The following instructions describe how to establish the initial serial connection to the serial converter module using a computer running HyperTerminal – terminal emulation software provided with most Windows 95/98/NT 4.0/2000/XP operating systems.

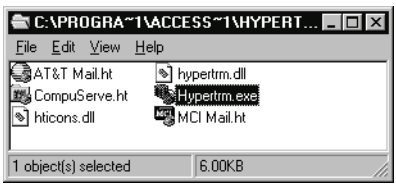
Important: The following instructions use screen captures from Windows 95 HyperTerminal. If you are using a different operating system the screens may differ.

To use HyperTerminal to access the serial converter module

1. Verify that the serial converter module is installed correctly. Refer to Chapter 2, Installing the Serial Converter Module.

2. On the Windows 95 desktop, click the **Start** button, and then select **Programs > Accessories > HyperTerminal** to display the HyperTerminal dialog box (see Figure 3.2). Your dialog box may look slightly different.

Figure 3.2 HyperTerminal Dialog Box in List View

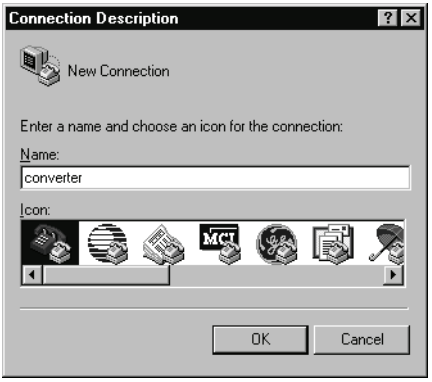


On the Windows NT desktop, click the **Start** button, and then select **Programs > Accessories > HyperTerminal** to display the Connection dialog box (see Figure 3.3). Then, go to step 4.

3. Double-click **Hypertrm.exe**.

The Connection Description dialog box appears in the HyperTerminal workspace.

Figure 3.3 Connection Dialog Box



4. In the Name window, type any name (for example, converter), and then select any icon in the Icon box.

5. Click **OK** to display the Phone Number dialog box (see Figure 3.4).

Figure 3.4 Phone Number Dialog Box

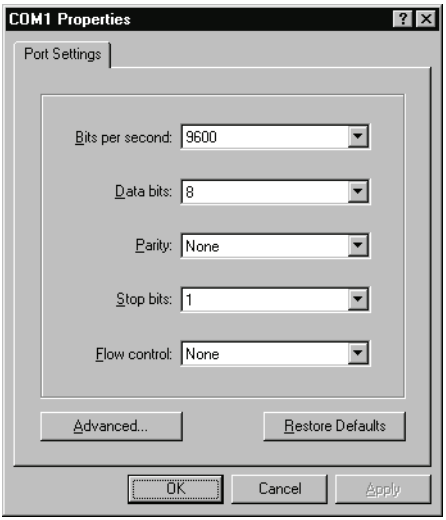
6. In the Connect Using window, select the communications port that you intend to use (usually Com1 or Com2).

7. Click **OK** to display the Properties dialog box.

8. Select the settings shown in Figure 3.5.

Important: If **Parameter 03 - [DF1 Rate Cfg]** was previously set to 19.2K or 38.4K, select that value in the Bits per second window.

Figure 3.5 Properties Dialog Box

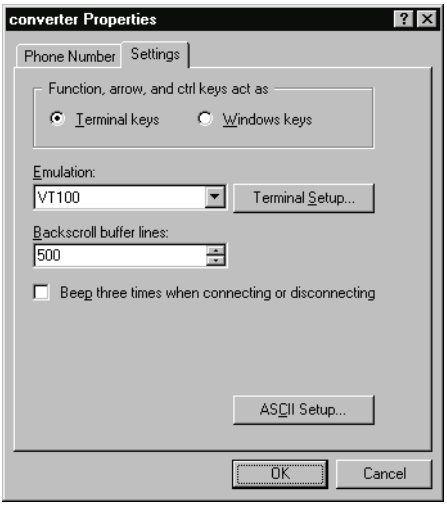


9. Click **OK**. A blank HyperTerminal workspace appears.

10. Select **File > Properties** to display the Properties dialog box.

11. Click the **Settings** tab (see Figure 3.6).

Figure 3.6 Properties Dialog Box



12. Under Function, arrow, and ctrl keys act as, select **Terminal keys**.

13. In the Emulation window, select **VT100**.

14. Click **OK** to display the HyperTerminal workspace.

TIP: Select **File > Save** to save the HyperTerminal configuration that you just created. In future connections, you can select the saved configuration and quickly connect to the serial converter module.

15. Press the **Enter** key until the main menu appears (see Figure 3.7).

Figure 3.7 Main Menu

```
Main Menu - Enter Number for Selection
1> Display Setup Parameters
2> Display Event Queue
3> Flash Upgrade
```

What do you want to do?	Page
Edit the serial port rate, or fault action	3-7 through 3-9
View the event queue	5-3
View DF1 data	5-5
Update the firmware	C-1

If no text or meaningless text appears instead of the Main Menu, adjust the baud rate in your software. Refer to Chapter 5 in the Troubleshooting Potential Problems section for detailed instructions.

To navigate in the terminal emulation software

Key	Description
0 ... 9	In the main menu, keys 1 – 3 select a menu option. In the parameter screen, keys 0 – 9 enter a value.
Esc	Display the main menu or abort changes to a parameter.
↑ OR ↓	Scroll through parameters or events.
→ OR ←	Scroll through the values for a parameter.
Enter	Save a value for a parameter.

Setting the RS-232 Serial Port Rate

The serial port rate, sometimes called baud rate or DF1 rate, is the speed at which the computer and serial converter module communicate over RS-232. You can select a serial port rate of 9600, 19.2K, or 38.4K. The factory-default serial port rate is 9600.

Important: If you change the serial port rate in the serial converter module, you must set your software to use the same serial port rate. The serial converter module must be reset or power cycled before baud rate changes take affect.

To set the serial port rate

1. Set **Parameter 03 - [DF1 Rate Cfg]** to the desired rate.

   Figure 3.8 DF1 Rate Cfg Parameter in HyperTerminal

   ```
   Press the UP ARROW or DOWN ARROW key to scroll
   through the parameter list. Press the LEFT ARROW
   or RIGHT ARROW key to modify parameter values.
   Press the ENTER key to save a new value.

   3> DF1 Rate Cfg = 9600
   ```

2. Reset the serial converter module. Refer to Resetting the Serial Converter Module section in this chapter.

3. Set the serial port rate in your software to match the new serial port rate in the serial converter module.

Setting the Fault Action

By default, when DF1 serial communications are disrupted (for example, a serial cable is disconnected) and control I/O is being transmitted, the serial converter module and connected drive respond by faulting. You can set a different response to communication disruptions using **Parameter 04 - [Comm Flt Action]**.

ATTENTION: Risk of injury or equipment damage exists. **Parameter 04 - [Comm Flt Action]** lets you determine the action of the serial converter module and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a hazard of injury or equipment damage.

To change the fault action

- Set the value of **Parameter 04 - [Comm Flt Action]** to the desired response:

Action	Description
Fault	The drive is faulted and stopped. (Default)
Stop	The drive is stopped, but not faulted (DSI host products only).
Zero data	The drive is sent 0 for output data after a communications disruption. This does not command a stop.
Hold last	The drive continues in its present state after a communications disruption.

Figure 3.9 Comm Flt Action Parameter in HyperTerminal

```
Press the UP ARROW or DOWN ARROW key to scroll
through the parameter list. Press the LEFT ARROW or
RIGHT ARROW key to modify parameter values. Press
the ENTER key to save a new value.

4> Comm Flt Action = Fault
```

Changes to this parameter take effect immediately. A reset is not required.

Resetting the Serial Converter Module

Change to settings on some module parameters require that you reset the serial converter module before the new settings take effect. You can reset the module by cycling power to the module or by using **Parameter 05 - [Reset Module]**.

ATTENTION: Risk of injury or equipment damage exists. If the serial converter module is transmitting control I/O to the drive (indicated by a solid green diamond LED), the drive may fault when you remove or reset the module. Determine how your drive will respond before removing or resetting a connected serial converter module.

To reset the serial converter

- Set **Parameter 05 - [Reset Module]** to either **Reset Module** or **Set Defaults**. “Reset Module” will reset the serial converter. “Set Defaults” will set all parameters in the serial converter to their factory-default values.

Figure 3.10 Reset Module Parameter in HyperTerminal

```
Press the UP ARROW or DOWN ARROW key to scroll
through the parameter list. Press the LEFT ARROW
or RIGHT ARROW key to modify parameter values.
Press the ENTER key to save a new value.

5> Reset Module = Reset Module
```

After you enter the “Reset Module” value, the serial converter will be reset. This parameter will then be reset to “Ready.”

Notes:

Controlling PowerFlex 4 and 40 Drives with Allen-Bradley Controllers

Chapter 4 illustrates how to use the 22-SCM-232 serial converter with Allen-Bradley controllers to control and read/write data to PowerFlex 4 and 40 drives.

Topic	Page
Controller Compatibility	4-1
Cabling Requirements	4-2
Messaging (MSG Instruction)	4-3
PowerFlex 4 and 40 Memory Addressing	4-4
Example Controller Programs	4-4

Controller Compatibility

Any Allen-Bradley controller capable of initiating and receiving DF1 messages can be used with the 22-SCM-232 serial converter:

- MicroLogix 1000 (Series C or later discrete controllers, and all analog controllers)
- MicroLogix 1200/1500
- SLC 5/03, 5/04, 5/05
- PLC5
- ControlLogix/CompactLogix

The 22-SCM-232 converts the protocol from DF1 to Modbus RTU, and the media from RS232 to RS485. It can be used for point-to-point and multiple drive applications (see Figure 4.1 and Figure 4.2 respectively).

Important: DSI HIMs (22-HIM-*) and/or DSI communication adapters (22-COMM-*) cannot be used in an Allen-Bradley controller/22-SCM-232 system.

Figure 4.1 Point-to-Point Example

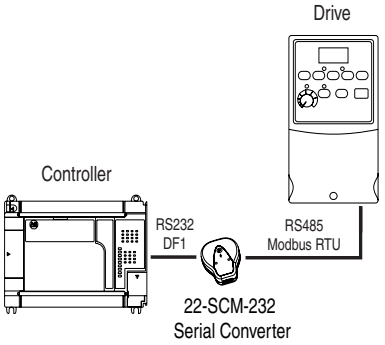
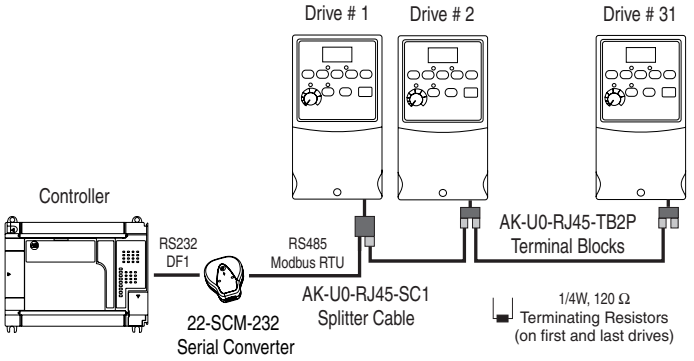


Figure 4.2 Multiple Drive Example



Cabling Requirements

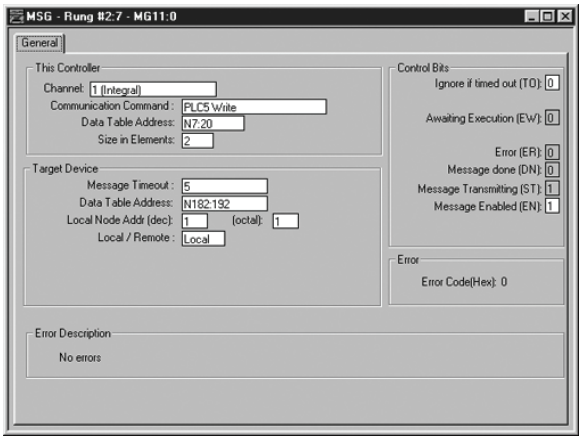
In addition to using the 22-SCM-232 serial converter module, the required cabling depends on the type of Allen-Bradley controller being used:

Controller Type	Requires 22-SCM-232 plus . . .
MicroLogix 1000/1200/1500 LSP	1761-CBL-PM02 or 1761-CBL-AP00 (8-pin DIN to 9-pin Female) and 1203-SNM Serial Null Modem adapter (9-pin Male to 9-pin Male)
MicroLogix 1500 LRP	—
SLC 5/03, 5/04 or 5/05	—
PLC5	9-pin Male to 25-pin Male adapter (3rd party)
ControlLogix/CompactLogix	—

Messaging (MSG Instruction)

Communications are handled via Message (MSG) instructions, which vary between the different controllers.

Figure 4.3 MicroLogix 1200/1500 MSG Setup Screen Example



The following descriptions are for the user configurable items of the MSG instruction.

MSG User Configurable Item	Description
Channel	Channel # to which the 22-SCM-232 is connected
Communication Command	Message type used
Data Table Address	Source of write data/destination of read data
Size in Elements	Number of words to read/write (32 max.)
Message Timeout	Number of seconds before the message times out
Data Table Address	Memory address in PowerFlex 4/40 to be accessed
Local Node Addr (dec)	PowerFlex 4/40 node address (decimal)
Local Node Addr (octal)	PowerFlex 4/40 node address (octal)
Local/Remote	Type of communication used

For additional information on MSG instruction setups, refer to the respective controller instruction set reference manuals:

Publication Name	Publication Number
MicroLogix 1000	1761-6.3
MicroLogix 1200/1500 Instruction Set Reference Manual	1762-RM001…
SLC	1747-RM001…
PLC5	1785-6.1
ControlLogix Manual	1756-RM003…
CompactLogix Manual	1769-UM007…

PowerFlex 4 and 40 Memory Addressing

PowerFlex 4 and 40 control and status information, and parameters are addressed using N: file addressing.

Logic Command/Reference

Control Data	Address
Logic Command	N182:192
Reference	N182:193

Logic Status/Feedback/Additional Monitor Data

Monitor Data	Address
Logic Status	N183:198
Drive Error Code	N183:199
Frequency Command	N183:200
Output Frequency (Feedback)	N183:201
Output Current	N183:202
DC Bus Voltage	N183:203
Output Voltage	N183:204
Step # of Multi-Step Speed Operation	N183:205
Step # of PLC Operation	N183:206
Time of PLC Operation	N183:207
Counter Value	N183:208

The Logic Command and Logic Status bit definitions are described in Appendix I.

Parameters

PowerFlex 4 and 40 parameters are addressed using Integer File N150:x, where “x” equals the actual parameter number in the drive. For example:

N150:39 = Parameter 39 - [Accel Time 1]

Example Controller Programs

Example ladder logic programs are provided for each type of controller platform. Refer to the appropriate appendix:

Controller Type	Example Ladder Logic Program
• MicroLogix 1000	See Appendix D
• MicroLogix 1200/1500	See Appendix E
• SLC	See Appendix F
• PLC	See Appendix G
• ControlLogix/CompactLogix	See Appendix H

Troubleshooting

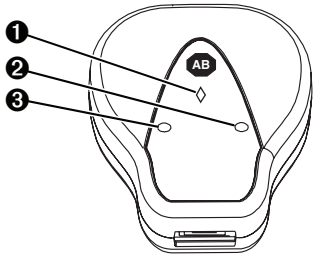
Chapter 5 provides information for troubleshooting potential problems with the serial converter module.

Topic	Page
Understanding the Status Indicators	5-1
Module Diagnostic Items	5-3
Viewing and Clearing the Event Queue	5-3
Viewing and Clearing DF1 Communication Statistics	5-5
Troubleshooting Potential Problems	5-6

Understanding the Status Indicators

The serial converter module has three status indicators to reports its operating status. See Figure 5.1.

Figure 5.1 Status Indicators on the Serial Converter



#	Status Indicator	Description	Refer To
1	Diamond	Serial converter status	Diamond Status Indicator on page 5-2
2	TX	Serial converter is transmitting data	TX Status Indicator on page 5-2
3	RX	Serial converter is receiving data	RX Status Indicator on page 5-2

Diamond Status Indicator

ATTENTION: Risk of injury or equipment damage exists. If the serial converter module is transmitting control I/O to the drive (indicated by a solid green diamond LED), the drive may fault when you remove or reset the module. Determine how your drive will respond before removing or resetting a serial converter module.

Status	Cause	Corrective Action
Off	Serial converter module is not powered or in Flash programming mode.	• Securely connect cables. • Apply power to the drive. • Wait while Flash is in progress.
Flashing Green	Serial converter module is operating and not transmitting control I/O.	No action. Removing or resetting the serial converter module will not cause a serial fault in the drive.
Solid Green	Serial converter module is operating and is or was transmitting control I/O.	No action. Removing or resetting the serial converter will cause a serial fault in the drive.
Flashing Red	The drive has not acknowledged the serial converter module.	• Securely connect cables. • Verify Parameter 1 - [Adapter Cfg] is set to "Auto."
Solid Red	Link failure.	• Securely connect cables. • Replace the cable. • Cycle power to the drive.
Orange		Contact Rockwell Automation Technical Support.

RX Status Indicator

Status	Cause	Corrective Action
Off	Serial converter module is not receiving data.	• Verify that data is being transmitted by the PC. • Securely connect cables. • Apply power to the drive. • Configure the computer software to use the same serial port rate as the converter module.
Flashing Green	Serial converter module is receiving data from the computer.	No action.

TX Status Indicator

Status	Cause	Corrective Action
Off	Serial converter module is not transmitting data.	• Verify that data is being transmitted. • Securely connect cables. • Apply power to the drive.
Flashing Green	Serial converter module is transmitting data to the computer.	No action.

Module Diagnostic Items

The following diagnostic items can be accessed using DriveExplorer (version 3.01 or higher).

No.	Name	Description
1	Field Flash Cnt	Number of times the module has been Field Flashed.
2	Adapter Events	The number of events in the event queue.
3	Reference	Current value of the Reference being transmitted to the drive by this module.
4	Logic Command	Current value of the Logic Command being transmitted to the drive by this module.
5	Logic Status	Current value of the Logic Status being received from the drive by this module.
6	Feedback	Current value of the Feedback being received from the drive by this module.

Viewing and Clearing the Event Queue

The serial converter module has an event queue that reports the history of its actions.

To view the event queue

1. Access the event queue using a configuration tool. Refer to the Configuration Tools section in Chapter 3.

2. Scroll through events in the event queue. The most recent event can be found at **2R > Event Queue 1**. The "R" stands for Read Only.

Figure 5.2 Example Event Queue in HyperTerminal

```
Press the UP ARROW or DOWN ARROW key to scroll
through the parameter list. Press the LEFT ARROW or
RIGHT ARROW key to modify parameter values. Press
the ENTER key to save a new value.

2R> Event Queue 1 = Normal Startup
```

Events

Many events in the Event queue occur under normal operation. If you encounter unexpected communications problems, the events may help you or Allen-Bradley personnel troubleshoot the problem. The following events may appear in the event queue:

Code	Event	Description
F0	No Event	No event present in the module event queue.
F1	Adapter Reset	The module was reset by the user.
F2	Slave Detected	Slave was detected to be present by master.
F3	Slave Removed	Slave was detected to be removed by master.
F4	Host Timeout	Timeout condition on Msg to Host.
F5	Slave Timeout	Timeout condition on Msg to Slave.
F6	Master Timeout	Timeout condition on Msg to Master.
F7	Serial Timeout	Timeout on Serial 232 side (w/control enabled).
F8	Control Enabled	The module has sent a “Soft Control Enable” command to the drive.
F9	Control Disabled	The module has sent a “Soft Control Disable” command to the drive.
F10	EEPROM Sum Flt	Startup sequence detected corrupt EEPROM storage in the module.

To clear the event queue

1. Access the event queue using a configuration tool. Refer to the Configuration Tools section in Chapter 3.

2. Set the value of **1 > Clr Event Queue** to **Enable**, and then press **Enter** to clear the event queue.

Figure 5.3 Reset Event Queue in HyperTerminal

```
Press the UP ARROW or DOWN ARROW key to scroll
through the parameter list. Press the LEFT ARROW or
RIGHT ARROW key to modify parameter values. Press
the ENTER key to save a new value.

1> Clr Event Queue = Enable
```

Viewing and Clearing DF1 Communication Statistics

If you encounter unexpected communications problems or are creating an application that uses DF1 data, you can view the communications statistics in the serial converter module. Parameters 06 through 17 store this data.

To view and clear DF1 data, you must access the main menu in the serial converter module firmware. Refer to the Configuration Tools section in Chapter 3.

To view DF1 data

1. Access the parameters in the serial converter using a configuration tool. Refer to the Configuration Tools section in Chapter 3.
2. Scroll through the DF1 parameters. Parameters 06 through 17 contain DF1 data. For a description of each parameter, refer to Appendix B, Serial Converter Module Parameters.

Figure 5.4 Example Parameter Display in HyperTermina

```
Press the UP ARROW or DOWN ARROW key to scroll
through the parameter list. Press the LEFT ARROW or
RIGHT ARROW key to modify parameter values. Press
the ENTER key to save a new value.

7R> DF1 Packets Sent = 0
```

To clear DF1 counters

1. Access the parameters in the serial converter using a configuration tool. Refer to the Configuration Tools section in Chapter 3.
2. Set the value of **Parameter 06 - [Clear DF1 Counts]** to **Clear Counts**, and then press **Enter** to clear the DF1 data.

Figure 5.5 Example Parameter Display in HyperTerminal

```
Press the UP ARROW or DOWN ARROW key to scroll
through the parameter list. Press the LEFT ARROW or
RIGHT ARROW key to modify parameter values. Press
the ENTER key to save a new value.

6> Clear DF1 Counts = Clear Counts
```

Troubleshooting Potential Problems

Description	Action
You are unable to establish a connection between your computer and the serial converter module.	• If the status indicators are off, connect the cables and apply power to the drive. • Configure your software and serial converter module to use the same COMM port and serial port rate (baud rate).
After changing the serial port rate, you are no longer able to communicate with the serial converter module and connected drive. For example, in HyperTerminal, meaningless text appears on the screen when you press Enter. In DriveExplorer, parameter values are not updated.	Reset the serial port rate in the software. Instructions are included here to reset the serial port rate in HyperTerminal and DriveExplorer. If you are using a different configuration tool, refer to its user manual. **HyperTerminal** 1. Select **File > Properties**, and then click **Configure**. 2. Select the new baud rate, and then click **OK**. 3. Save and close HyperTerminal. 4. Double-click on your HyperTerminal file (*.ht) to restart HyperTerminal. 5. Press **Enter** until the main menu appears. **DriveExplorer** 1. Select **Explore > Configure Communication**. 2. Select the new baud rate. DriveExplorer should start updating values again. If it does not, restart DriveExplorer.
You set a new serial port rate, but the serial converter module is still using the old serial port rate.	Reset the serial conveter module. Refer to Chapter 3, Configuring the Serial Converter Module.
No communications to the drive.	• Verify cable connections. • Make sure Parameter 1 - [Adapter Cfg] is set to “Auto.”

Specifications

Appendix A presents the specifications for the serial converter module.

Topic	Page
Communications	A-1
Electrical	A-1
Mechanical	A-1

Topic	Page
Environmental	A-2
Agency Certification	A-2

Communications

RS-232 side	
Protocol	RS-232 Serial DF1, Full Duplex
Port Rate	9600, 19.2K, or 38.4K
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None
Error	CRC or BCC (Auto-Detected)
DSI Host side	
Protocol	Drive Serial Interface (DSI)
Data Rates	19.2K

Electrical

Consumption	170mA at + 5V DC The serial converter draws the required power from the connected product. An external power source is not required.

Mechanical

Dimensions	
Height	103.5 mm (4.08 inches)
Width	73.4 mm (2.89 inches)
Depth	23.6 mm (0.93 inches)
Weight	70.88 g (2.5 oz.)

Environmental

Temperature Operating Storage	 0 to +50° C (32 to 122° F) -40 to +85° C (-40 to 185° F)
Relative Humidity	5 to 95% non-condensing
Atmosphere	**Important:** Serial converter module **must not** be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the module is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.
Vibration Operating Non-Operating	 2.5G @5Hz-2KHz 5G @5Hz-2KHz
Shock Operating Non-Operating	 30 G peak acceleration, 11 (±1) ms pulse width 50 G peak acceleration, 11 (±1) ms pulse width

Agency Certification

UL cUL CE	UL508C CAN/CSA C22.2 No. 14-M91 EN50178 and EN61800-3
CTick	AS/NZS 2064, Group 1, Class A

Important: For this product to be CE and CTick compliant, the shield of the serial cable and DSI cable must be terminated as described on Page 2-2.

Serial Converter Module Parameters

Appendix B provides information about the serial converter module parameters.

Parameter List

No.	Name and Description	Details
01	**[Adapter Cfg]** Sets the operation of the serial converter module on DSI. Leave at "Auto" (setting) when used with software tools. **Important:** Parameter 1 - [Adapter Cfg] must be set to "Auto" (default) for DriveExplorer to operate. HyperTerminal can be used if Parameter 1 - [Adapter Cfg] needs to be changed (See Using Terminal Emulation Software).	Default: 0 = Auto Values: 0 = Auto 1 = Master 2 = Slave 3 = RTU Master 4 = RTU Passthru Type: Read/Write Reset Required:
02	**[DF1 Addr Cfg]** Sets the DF1 node address for the serial converter module. This is a decimal value.	Default: 1 Minimum: 0 Maximum: 254 Type: Read/Write Reset Required: Yes
03	**[DF1 Rate Cfg]** Sets the serial port rate for the RS-232 DF1 serial port on the serial converter module. **Important:** If you change the serial port rate in the serial converter module, you must set your software to use the same serial port rate. The serial converter module must be reset or power cycled before baud rate changes take affect.	Default: 0 = 9600 Values: 0 = 9600 1 = 19.2K 2 = 38.4K Type: Read/Write Reset Required: Yes
04	**[Comm Flt Action]** Sets the action that the serial convertermodule and drive take if the module detects that DF1 serial communications are disrupted. This setting is effective only if I/O that controls the drive is transmitted through the serial converter module.	Default: 0 = Fault Values: 0 = Fault 1 = Stop 2 = Zero Data 3 = Hold Last Type: Read/Write Reset Required: No

ATTENTION: Risk of injury or equipment damage exists. **Parameter 04 - [Comm Flt Action]** lets you determine the action of the serial converter module and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a hazard of injury or equipment damage.

No.	Name and Description	Details
05	**[Reset Module]** No action if set to "Ready." Resets the serial converter module if set to "Reset Module." Restores the module to its factory-default settings if set to "Set Defaults." This parameter is a command. It will be reset to "0 = Ready" after the command has been performed.	Default: 0 = Ready Values: 0 = Ready 1 = Reset Module 2 = Set Defaults Type: Read/Write
	ATTENTION: Risk of injury or equipment damage exists. If the serial converter module is transmitting I/O that controls the drive (indicated by a solid green diamond LED), the drive may fault when you remove or reset the module. Determine how your drive will respond before removing or resetting a connected serial converter module.	
06	**[Clear DF1 Counts]** No action if set to "Ready." Resets the DF1 statistical parameters (numbers 07 – 15) to 0 if set to "Clear Counts." This parameter is a command. It will be reset to "0 = Ready" after the command has been performed.	Default: 0 = Ready Values: 0 = Ready 1 = Clear Counts Type: Read/Write Reset Required: No
07	**[DF1 Packets Sent]** Displays the number of DF1 packets sent by the serial converter module. The value of this parameter is normally approximately equal to the value of Parameter 08 - [DF1 Packets Rcvd].	Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read Only
08	**[DF1 Packets Rcvd]** Displays the number of DF1 packets received by the serial converter module. The value of this parameter is normally approximately equal to the value of Parameter 07 - [DF1 Packets Sent].	Default: 0 Minimum: 0 Maximum: 4294967295 Type: Read Only
09	**[Undelivered Msgs]**(1) Displays the number of DF1 messages that were sent but not acknowledged.	Default: 0 Minimum: 0 Maximum: 65535 Type: Read Only
10	**[ENQs Sent]**(1) Displays the number of ENQ characters sent by the serial converter module.	Default: 0 Minimum: 0 Maximum: 65535 Type: Read Only
11	**[ENQs Received]**(1) Displays the number of ENQ characters received by the serial converter module.	Default: 0 Minimum: 0 Maximum: 65535 Type: Read Only
12	**[NAKs Received]**(1) Displays the number of NAK characters received by the serial converter module.	Default: 0 Minimum: 0 Maximum: 65535 Type: Read Only
13	**[NAK Bad Packet]**(1) Displays the number of NAKs sent by the serial converter module because of corrupt packets (improper protocol messages) as determined by the module.	Default: 0 Minimum: 0 Maximum: 65535 Type: Read Only

(1) This value is normally a low value. If it is continually incrementing and you are having communications problems, use a lower baud rate or replace the 1203-SFC serial cable.

No.	Name and Description	Details	
14	**[NAK No Memory]**(1) Displays the number of NAKs sent by the serial converter module because it did not have sufficient memory to buffer the incoming messages. The module runs out of memory if a command has not completed and there is no place to save the new commands.	Default: Minimum: Maximum: Type:	0 0 65535 Read Only
15	**[Duplicate Msgs]**(1) Displays the number of duplicate messages sent to the serial converter module. This value contains the total number of consecutive messages received by the module with the same TNS (Transaction Sequence) number.	Default: Minimum: Maximum: Type:	0 0 65535 Read Only
16	**[DF1 Addr Actual]** Displays the DF1 address actually used by the serial converter module.	Default: Minimum: Maximum: Type:	1 0 254 Read Only
17	**[DF1 Rate Actual]** Displays the serial port rate actually used for the DF1 serial port on the serial converter module.	Default: Values: Type:	0 = 9600 0 = 9600 1 = 19.2K 2 = 38.4K Read Only
18	**[Adapter Type]** Displays the present operating mode for the serial converter module.	Default: Values: Type:	0 = Master 0 = Master 1 = Slave 2 = RTU Master 3 = RTU Passthru Read Only

(1) This value is normally a low value. If it is continually incrementing and you are having communications problems, use a lower baud rate or replace the 1203-SFC serial cable.

Notes:

Flash Updates

Appendix C provides information on updating peripheral product firmware.

Topic	Page
Preparing for a Flash Update	C-1
Performing a Flash Update with HyperTerminal	C-2
Troubleshooting Potential HyperTerminal Flash Problems	C-3

Preparing for a Flash Update

Please take the following precautions to ensure a successful Flash:

- Obtain the new firmware version from Rockwell Automation, Inc. Save it to the hard drive of the computer. Do not attempt to perform a Flash from a floppy disk or a network.
- Read all instructions supplied with the new firmware file.
- Use a computer running terminal emulation software that supports Xmodem transfers (e.g. HyperTerminal). In this manual, we show how to use HyperTerminal.
- Record parameter values in the device that will be flashed. Updates may reset parameters to their default settings.
- Ensure that the DSI-enabled drive (e.g. PowerFlex 4) is stopped.
- Close all programs except the terminal emulation program that you are using to Flash the serial converter module.
- If you are using a laptop computer, turn off the FIFO buffers in HyperTerminal. In HyperTerminal, select **File > Properties** to display the Properties dialog box. Click **Configure**, and then click **Advanced**. Ensure that a check mark does not appear next to Use FIFO buffers.

Performing a Flash Update with HyperTerminal

1. In the main menu (Figure 3.7), press **3** to Update Flash program.

   The screen in Figure C.1 will immediately appear.

   Figure C.1 Flash Menu

   ```
   To update the Flash memory, you need a terminal
   program capable of downloading a binary file using
   the XMODEM protocol and a Flash update file from
   Rockwell Automation. When you press 'Y' to signal
   that you are ready to proceed, the terminal
   program will start displaying the letter 'C'. This
   signals the XMODEM protocol that the download may
   proceed. You then have one minute to start the
   transfer. Press CTRL-X to cancel an update started
   by mistake. Are you ready to proceed? (Y/N)
   ```

   ATTENTION: Risk of injury or equipment damage exists. When you perform a Flash update, the drive will fault if it is receiving control I/O from the serial converter module. Verify that the drive has stopped safely or is receiving control I/O from an alternate source before beginning a Flash update.

   ATTENTION: Risk of equipment damage exists. If you interrupt a flash procedure that is updating boot code, the device may become inoperable. To prevent this damage, follow the instructions provided with the new firmware file and do not interrupt a flash procedure while boot code is being flashed.

2. If the Flash can be completed safely, type **Y**. The letter “C” repeatedly appears. It is the Xmodem prompt and continues to appear until you send a binary file.

   Important: Press Ctrl + X to cancel a Flash update procedure.

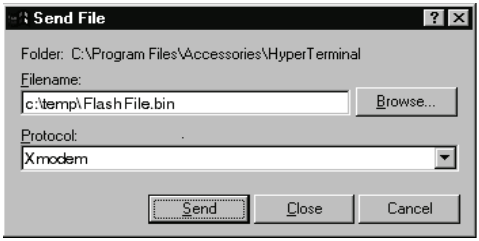
3. Select **Transfer > Send File** to display the send file dialog box.

4. Click **Browse** and navigate to the Flash file.

5. Double-click the file. Its name appears in the Filename box (see Figure C.2).

6. In the Protocol box, select Xmodem.

Figure C.2 Example Send File Dialog Box



7. Click **Send**. A dialog box appears and reports the progress of the download. When it is complete, the message "Operation Complete" appears.

   Important: Keep the device powered for 15 seconds after the operation has completed.

8. Press the Enter key to return to the main menu.

Troubleshooting Potential HyperTerminal Flash Problems

Description	Corrective Action
"Transfer Cancelled by Remote System" message appears and the Flash is not completed.	• Restart HyperTerminal and repeat the Flash procedure. • If you are using Windows NT 4.0, install SP3 or later. Windows NT service packs are available from the Microsoft web site: http://www.microsoft.com. • Download a HyperTerminal Private Edition update from the Hilgraeve web site: http://www.hilgraeve.com. (Please note that there is a license requirement with this software.) Then, perform the Flash procedure again.
The "Xmodem File Send" for dialog box appears, but the Flash file is not transferred.	• Verify that you have selected the Xmodem protocol in the Send file dialog box. • Verify that the new file is on your hard disk. Do not attempt to Flash from a floppy disk or a network. • Verify that you are sending the file within 60 seconds of pressing "Y" to confirm that you want to perform the Flash.
After completing a Flash, you are unable to communicate with the serial converter module. For example, meaningless text appears on the HyperTerminal screen.	Set the serial port rate to 9600. If parameters are changed during a Flash update, all parameters are set to their default settings.

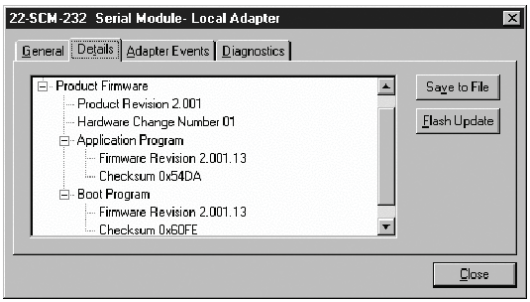
Performing a Flash Update with DriveExplorer

DriveExplorer version 4.xx and higher can perform flash updates on DSI products that use flash memory, such as the 22-SCM-232 Serial Converter Module and 22-COMM-D DeviceNet adapter. A 22-SCM-232 (version 2.01 or higher) is required to perform the update.

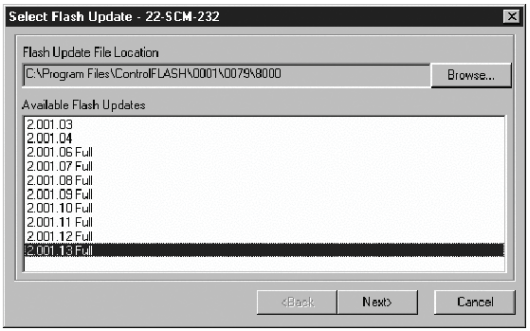
DriveExplorer utilizes the same files used by ControlFlash, which can be downloaded from www.ab.com/drives.

The following steps illustrate how to flash update a 22-SCM-232, and can be applied to flashing other DSI products.

1. Connect the 22-SCM-232 using DriveExplorer, and select "Explore | Device Properties …" Click on the Details tab to display the information about the 22-SCM-232. Click on the Flash Update button.

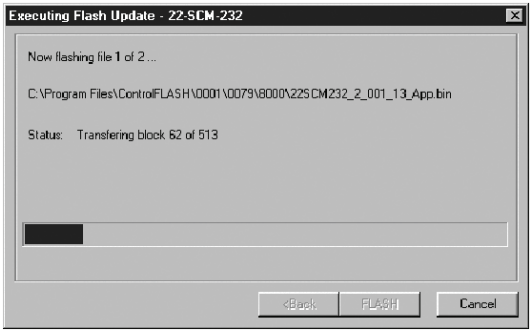


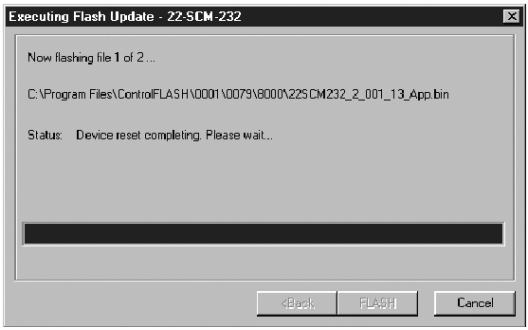
2. Select the revision of firmware that you wish to update to, and click on the Next> button.

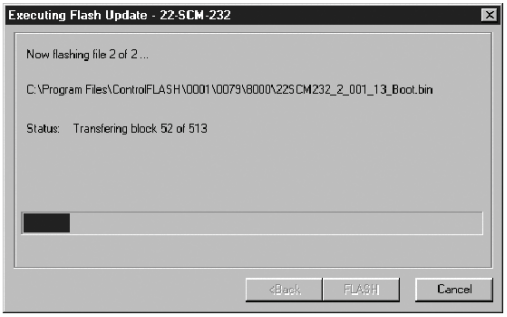


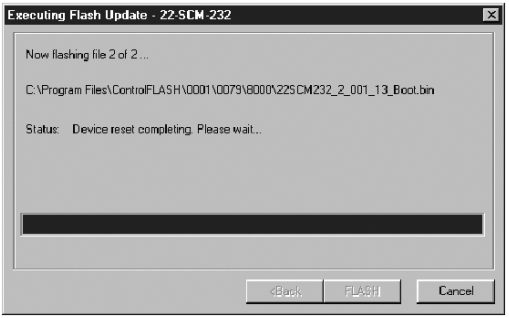
3. Confirm that this is what you want to do by clicking the FLASH button.

4. The following dialog boxes will display information about the progress of the flash.

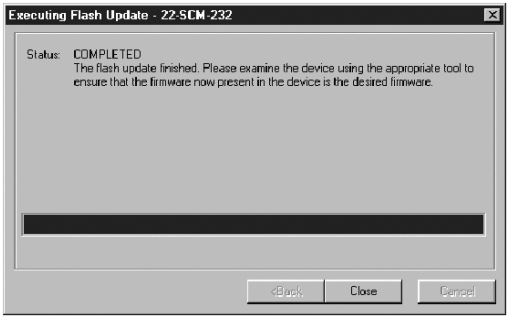




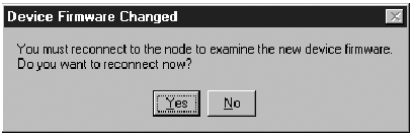




5. When the flash is completed, the “FLASH” button changes to “Close” and the “Cancel” button is grayed out.



6. DriveExplorer will prompt you to reconnect since the device may have changed its database because of the flash. Click “Yes” to reconnect.



MicroLogix 1000 Example Ladder Program

Appendix D provides information on a MicroLogix 1000 example ladder program. The following ladder example demonstrates:

- Writing Logic Command and Reference
- Reading Logic Status, Feedback, and additional monitor data
- Writing/reading Parameter 39 - [Accel Time 1]

Figure D.1 Example MicroLogix 1000 Ladder Logic Program

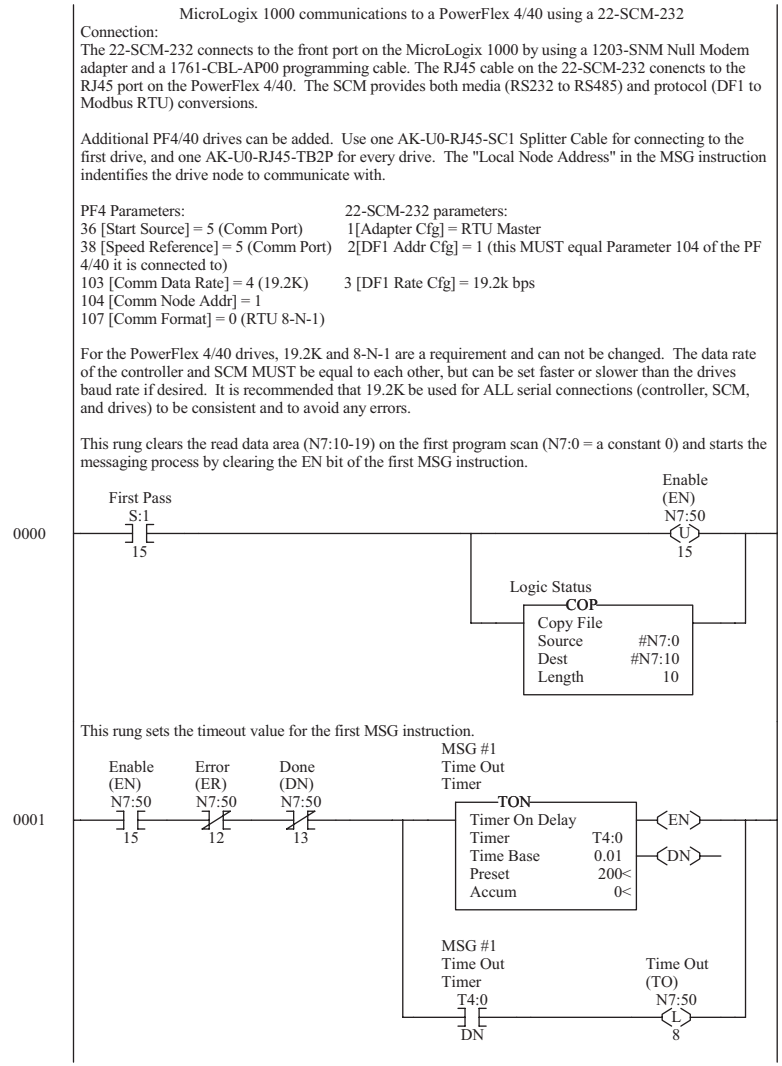


Figure D.1 Example MicroLogix 1000 Ladder Logic Program (Continued)

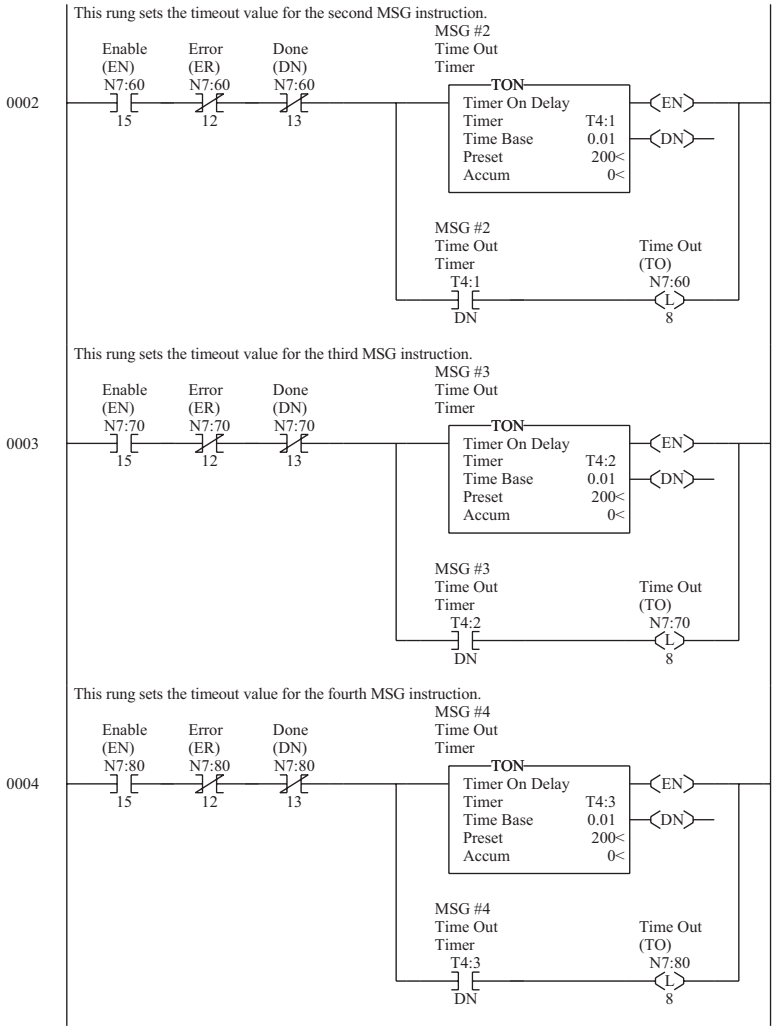


Figure D.1 Example MicroLogix 1000 Ladder Logic Program (Continued)

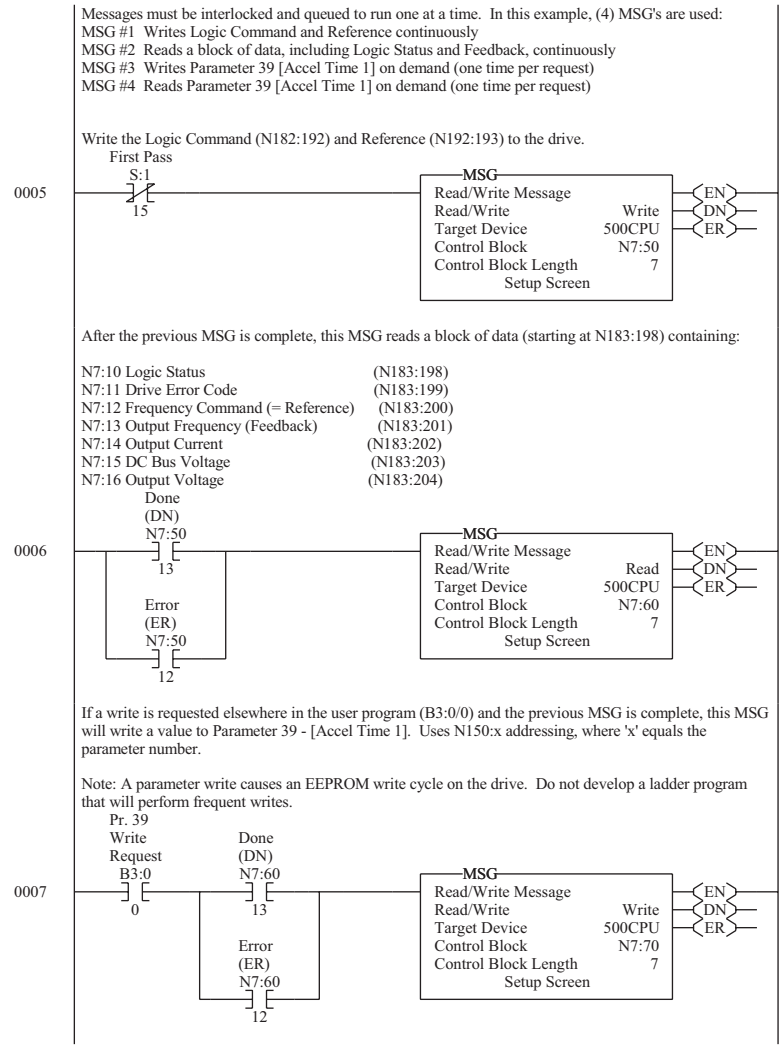


Figure D.1 Example MicroLogix 1000 Ladder Logic Program (Continued)

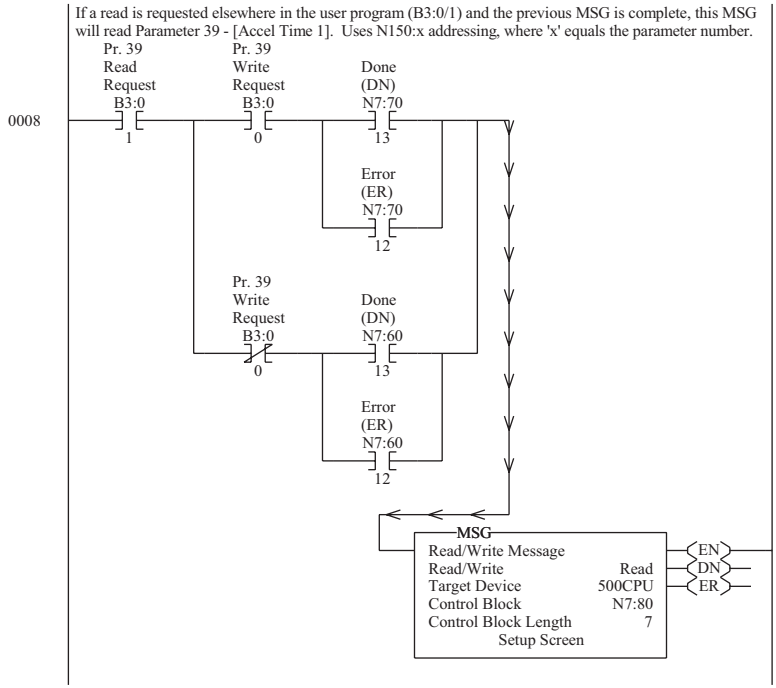


Figure D.1 Example MicroLogix 1000 Ladder Logic Program (Continued)

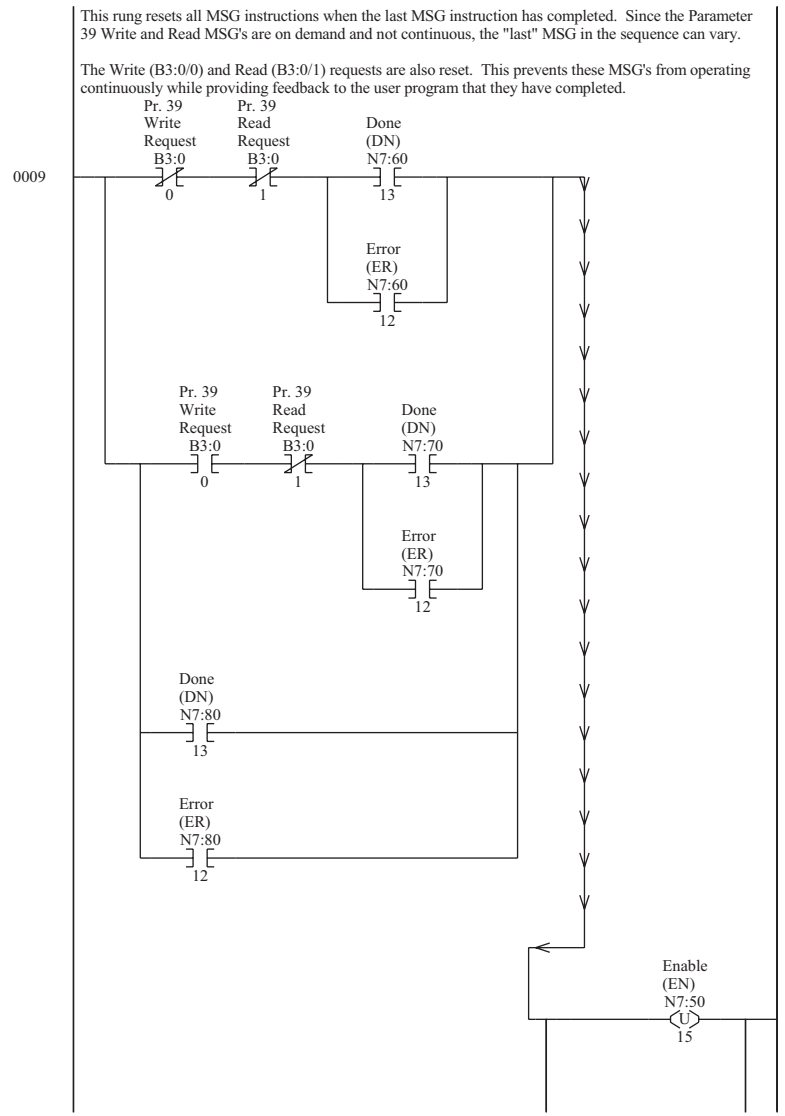
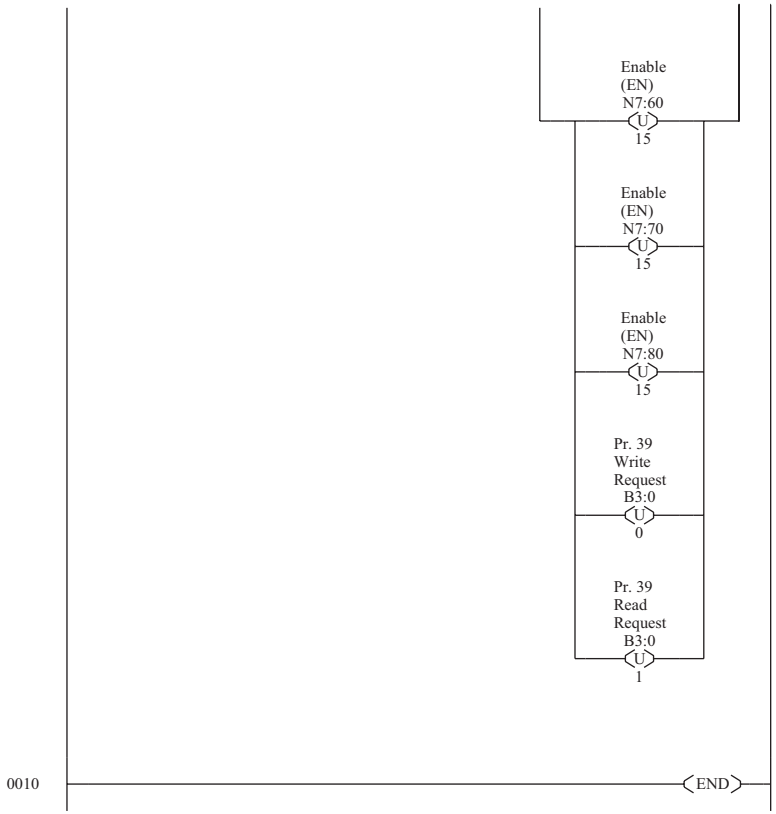
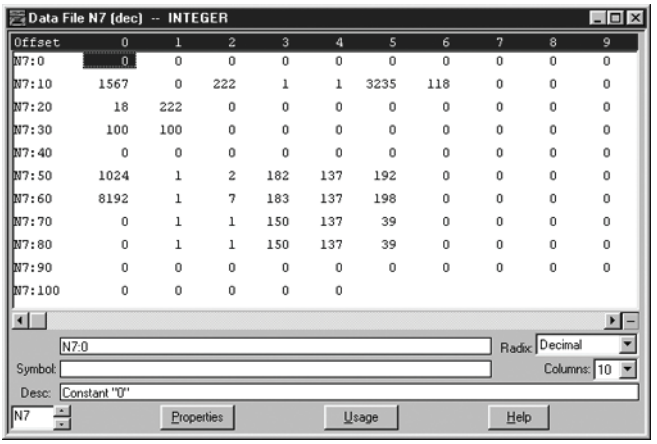


Figure D.1 Example MicroLogix 1000 Ladder Logic Program (Continued)



The data table used by the example ladder program is explained below:

Figure D.2 MicroLogix 1000 Ladder Example Data Table Values



N7: Address	Name	Example Value (decimal)	Example Value Description
0	Constant “0”	0	Fixed to “0” and used to clear read data on the first scan of the ladder program
10	Logic Status	1567	See Logic Status bit descriptions (Appendix I)
11	Drive Error Code	0	No errors
12	Commanded Frequency	222	22.2 Hz
13	Output Frequency (feedback)	1	0.1 Hz
14	Output Current	1	0.01 A
15	DC Bus Voltage	3235	323.5 V
16	Output Voltage	118	11.8 V
20	Logic Command	18	See Logic Command bit descriptions (Appendix I)
21	Reference	222	22.2 Hz
30	Pr. 39 - [Accel Time 1] Write Value	100	10.0 Seconds
31	Pr. 39 - [Accel Time 1] Read Value	100	10.0 Seconds

The following screens (Figure D.3 to Figure D.6) provide details of the MSG instructions used in the ladder example:

Figure D.3 Rung 5 Logic Command/Reference Write Message

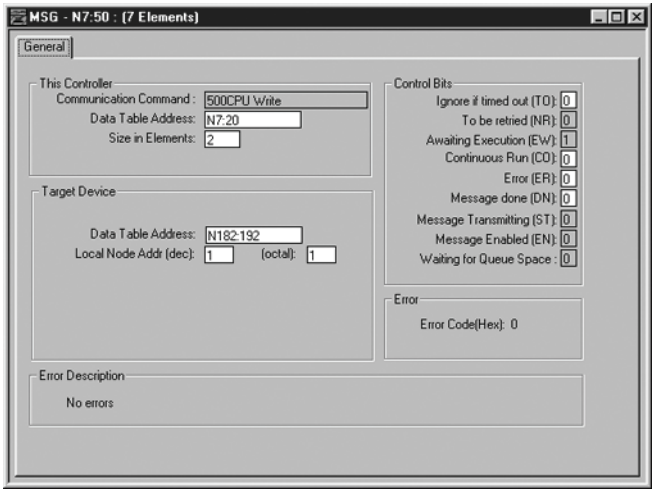


Figure D.4 Rung 6 Logic Status/Feedback/Other Monitor Data Read Message

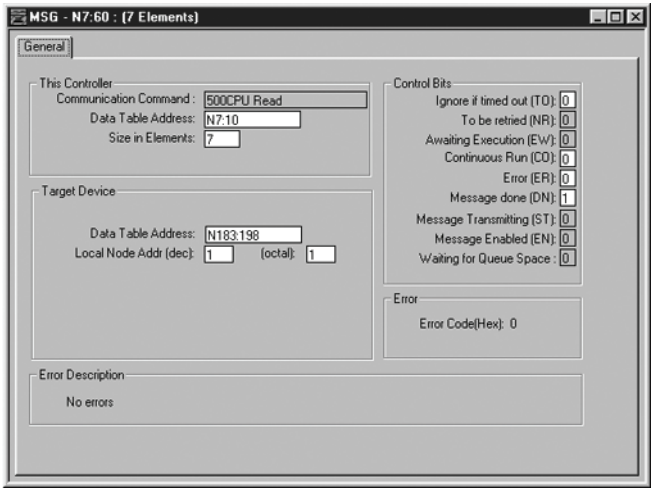


Figure D.5 Rung 7 Parameter 39 - [Accel Time 1] Write Message

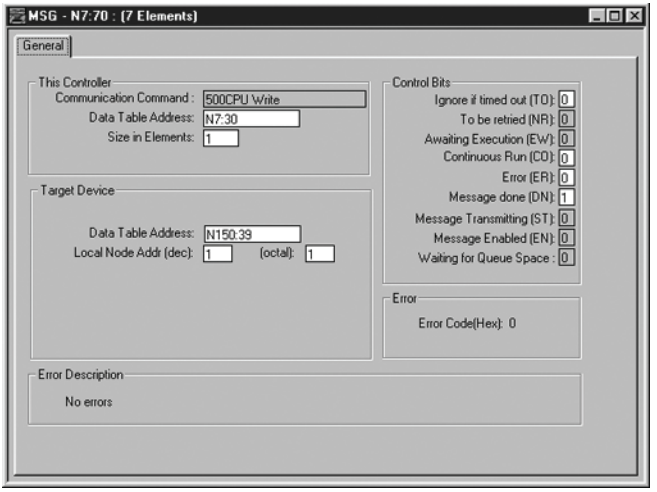
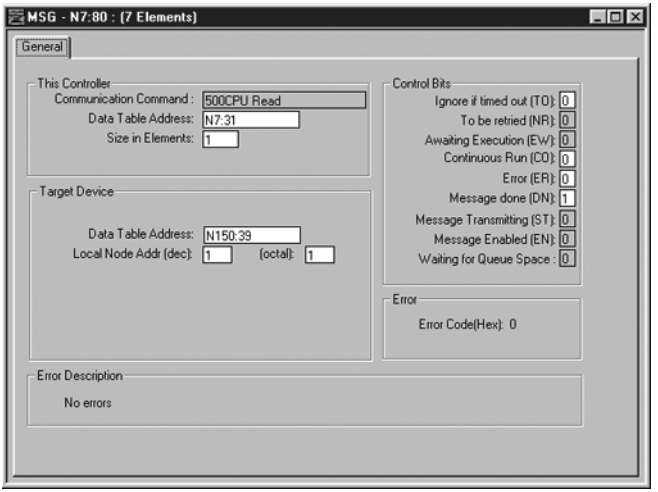


Figure D.6 Rung 8 Parameter 39 - [Accel Time 1] Read Message



MicroLogix 1200/1500 Example Ladder Program

Appendix E provides information on a MicroLogix 1200/1500 example ladder program. The following ladder example demonstrates:

- Writing Logic Command and Reference
- Reading Logic Status, Feedback, and additional monitor data
- Writing/reading Parameter 39 - [Accel Time 1]

The example ladder program is for a MicroLogix 1500, but can also be applied to the MicroLogix 1200.

Figure E.1 Example MicroLogix 1200/1500 Ladder Logic Program

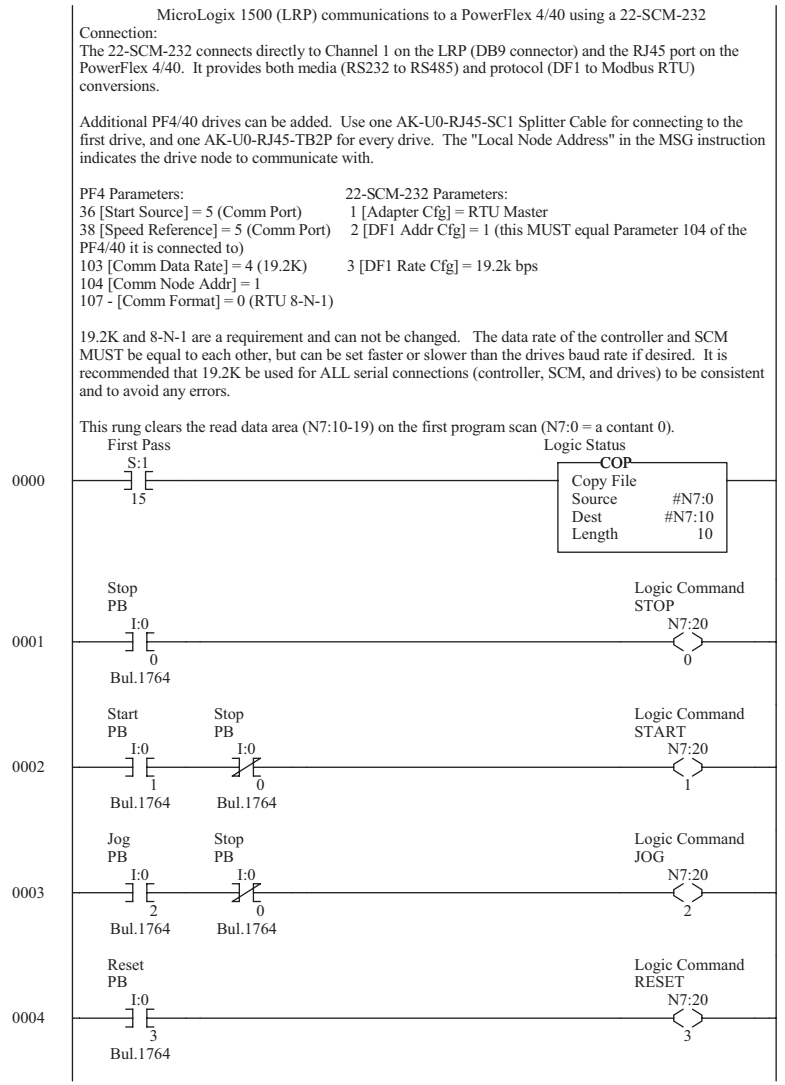


Figure E.1 Example MicroLogix 1200/1500 Ladder Logic Program (Continued)

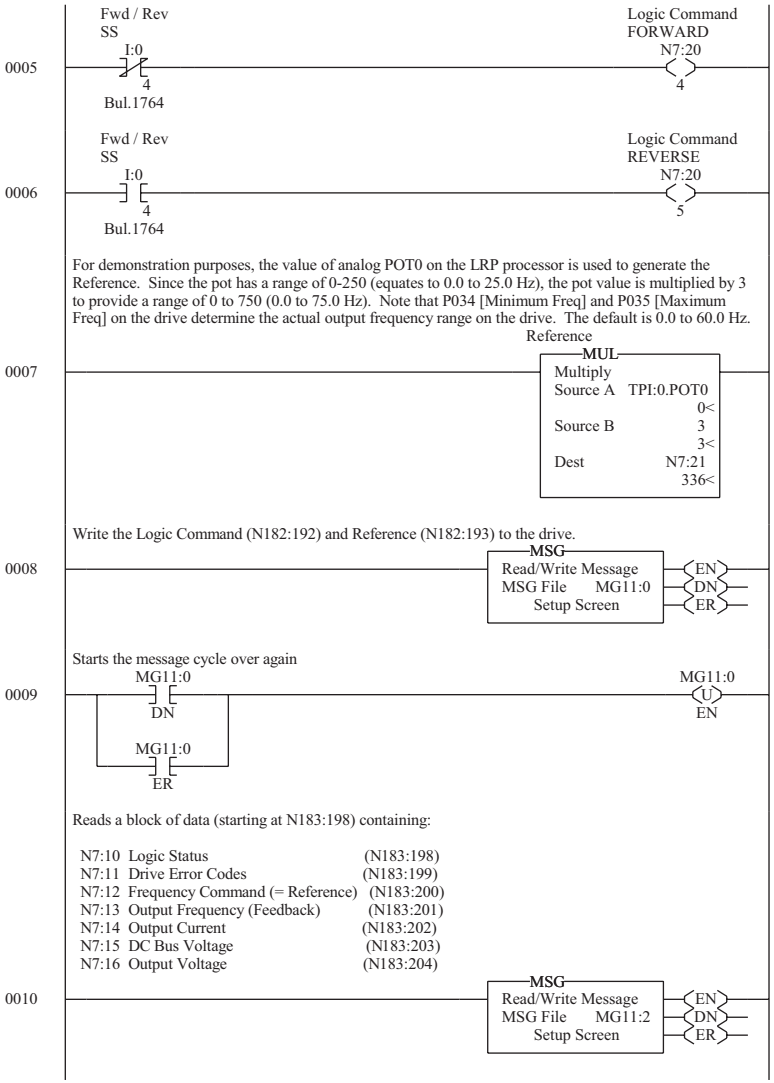
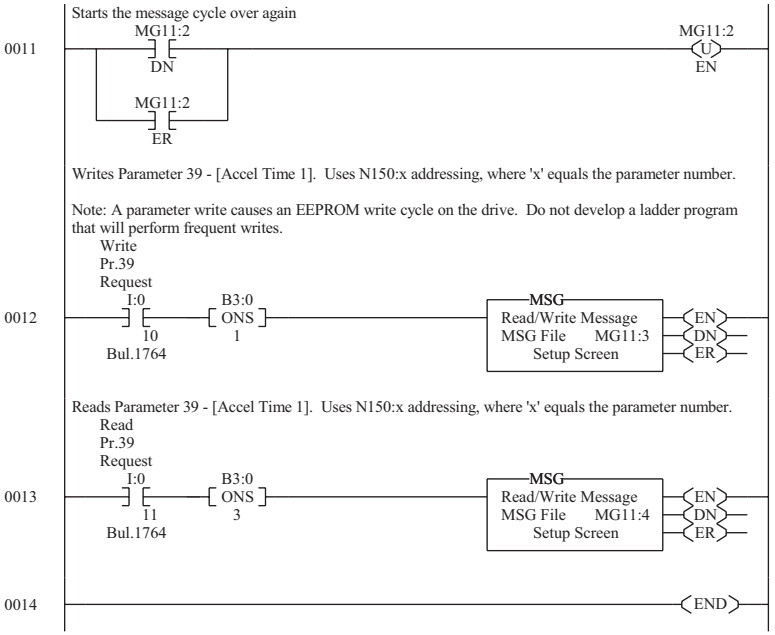
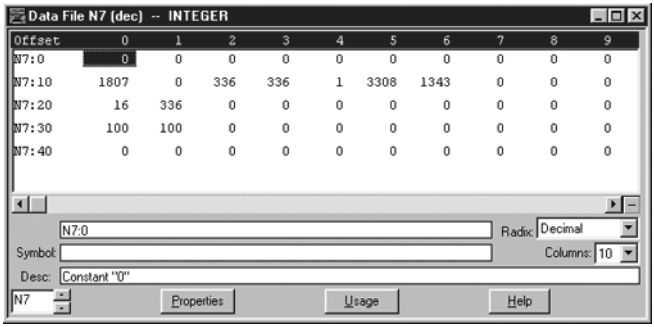


Figure E.1 Example MicroLogix 1200/1500 Ladder Logic Program (Continued)



The data table used by the example ladder program is explained below:

Figure E.2 MicroLogix 1200/1500 Ladder Example Data Table Values



N7: Address	Name	Example Value (decimal)	Example Value Description
0	Constant “0”	0	Fixed to “0” and used to clear read data on the first scan of the ladder program
10	Logic Status	1807	See Logic Status bit descriptions (Appendix I)
11	Drive Error Code	0	No errors
12	Commanded Frequency	336	33.6 Hz
13	Output Frequency (feedback)	336	33.6 Hz
14	Output Current	1	0.01 A
15	DC Bus Voltage	3308	330.8 V
16	Output Voltage	1343	134.3 V
20	Logic Command	16	See Logic Command bit descriptions (Appendix I)
21	Reference	336	33.6 Hz
30	Pr. 39 - [Accel Time 1] Write Value	100	10.0 Seconds
31	Pr. 39 - [Accel Time 1] Read Value	100	10.0 Seconds

The following screens (Figure E.3 to Figure E.6) provide details of the MSG instructions used in the ladder example:

Figure E.3 Rung 8 Logic Command/Reference Write Message

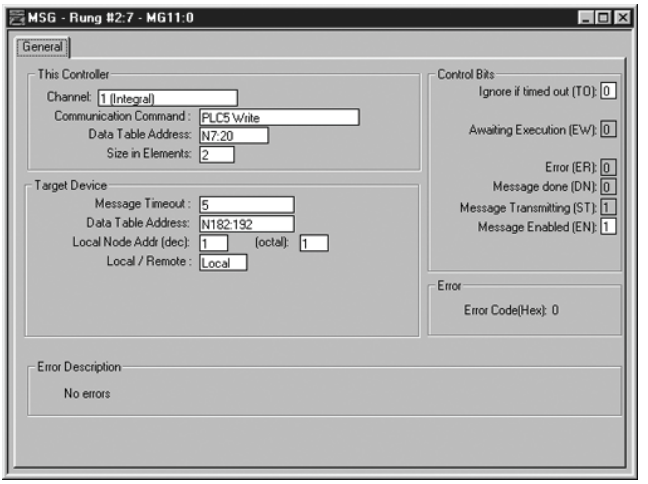


Figure E.4 Rung 10 Logic Status/Feedback/Other Monitor Data Read Message

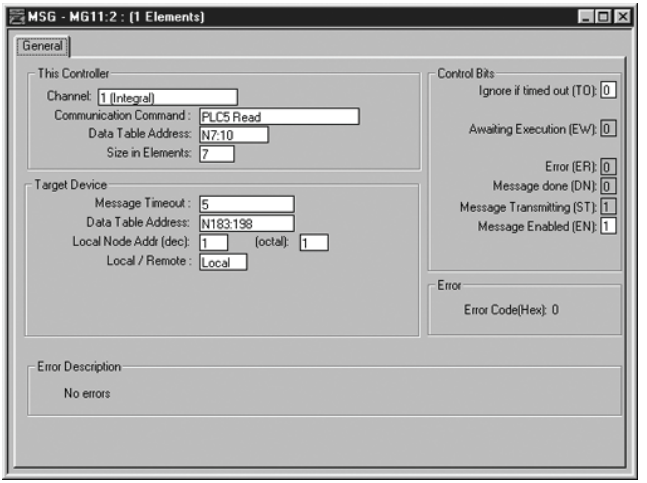


Figure E.5 Rung 12 Parameter 39 - [Accel Time 1] Write Message

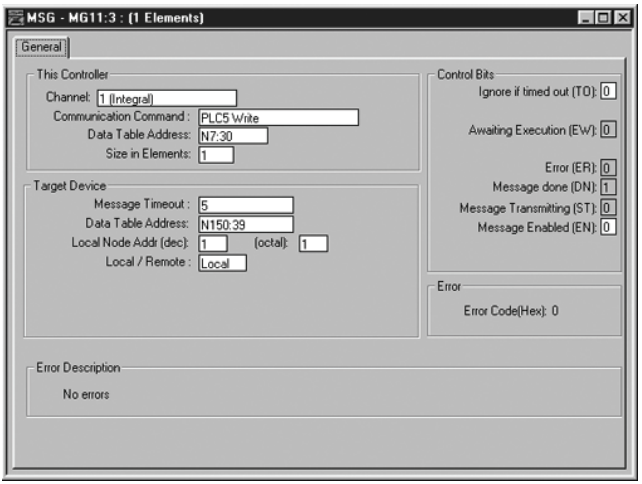
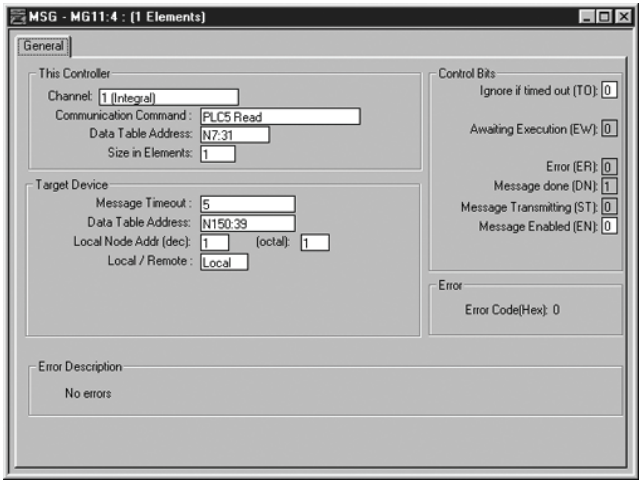


Figure E.6 Rung 13 Parameter 39 - [Accel Time 1] Read Message



Notes:

SLC Example Ladder Program

Appendix F provides information on an SLC example ladder program. The following ladder example demonstrates:

- Writing Logic Command and Reference
- Reading Logic Status, Feedback, and additional monitor data
- Writing/reading Parameter 39 - [Accel Time 1]

Figure F.1 Example SLC Ladder Logic Program

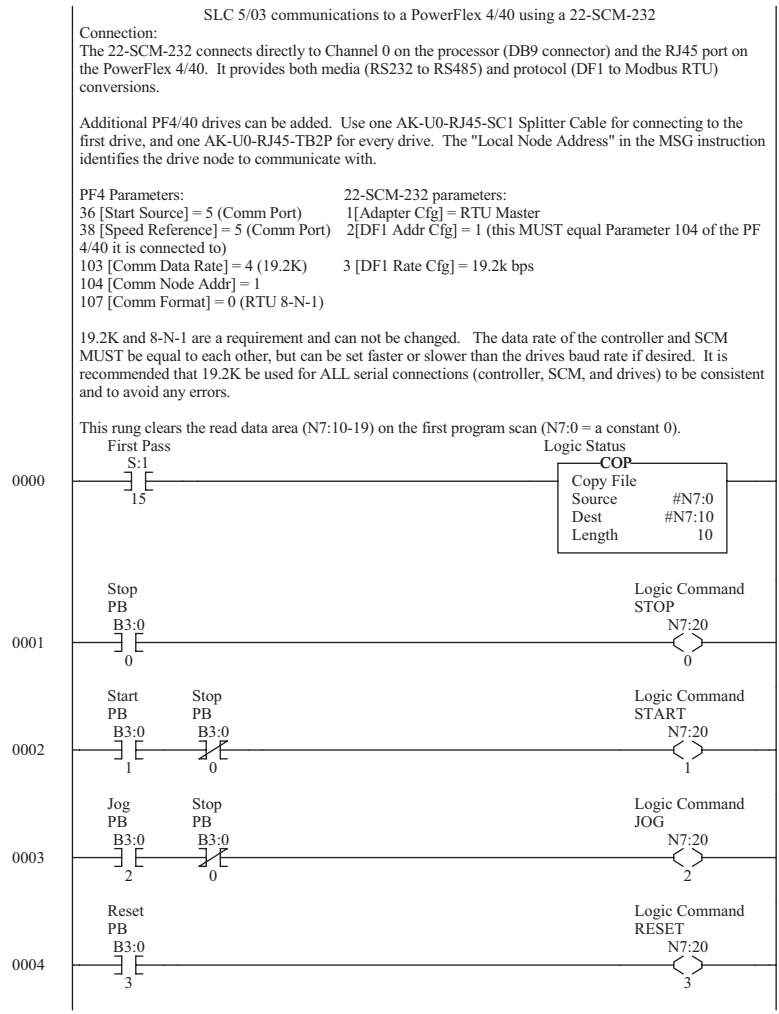


Figure F.1 Example SLC Ladder Logic Program (Continued)

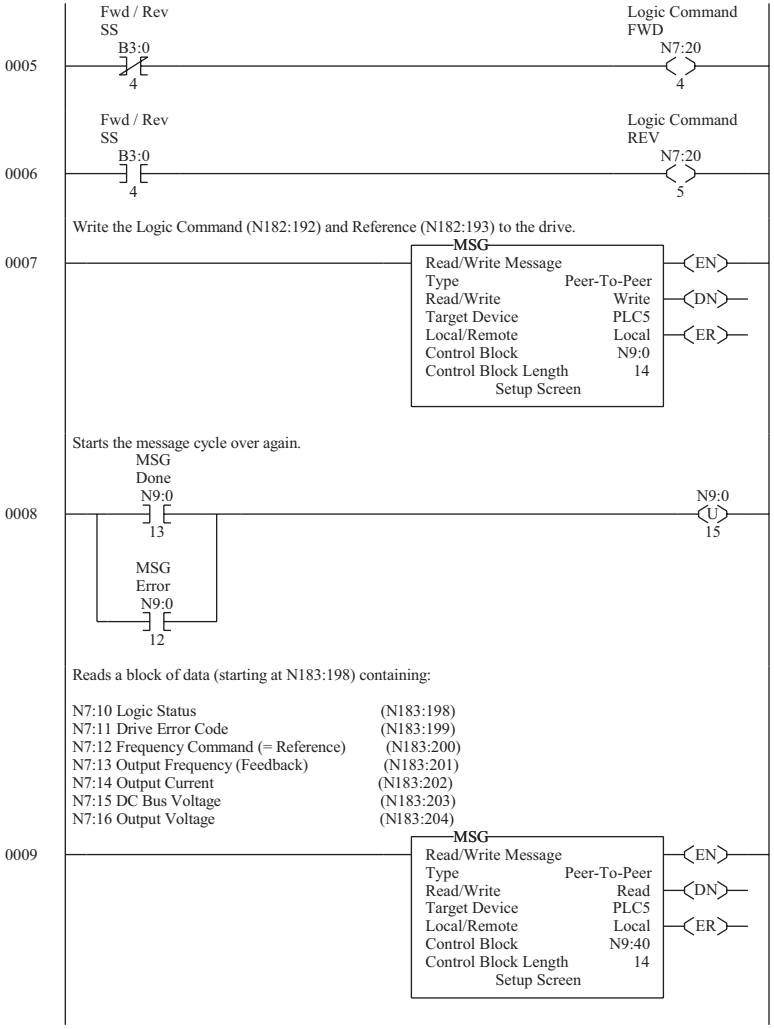
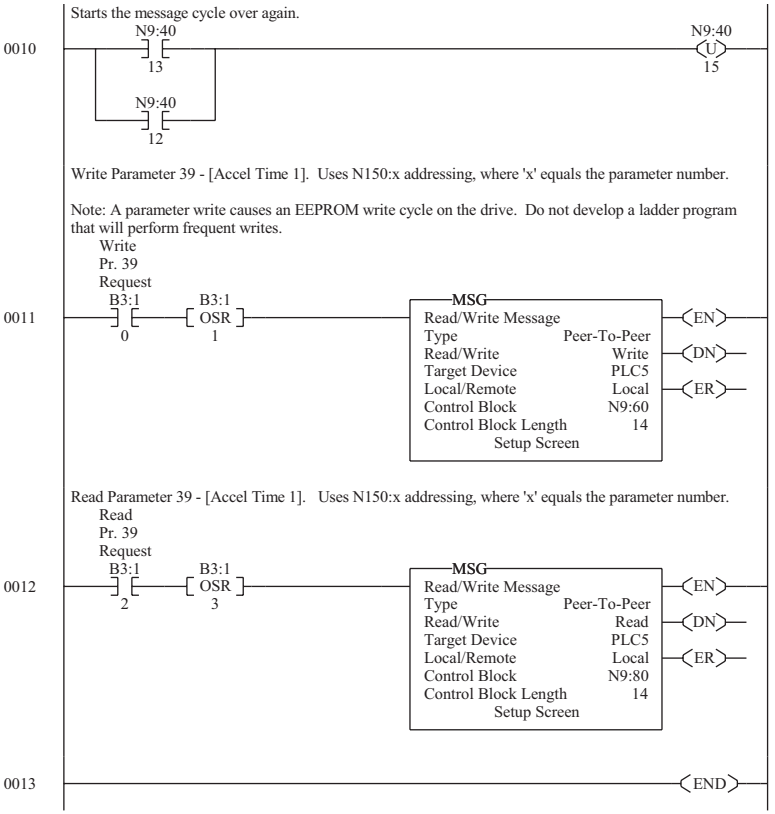
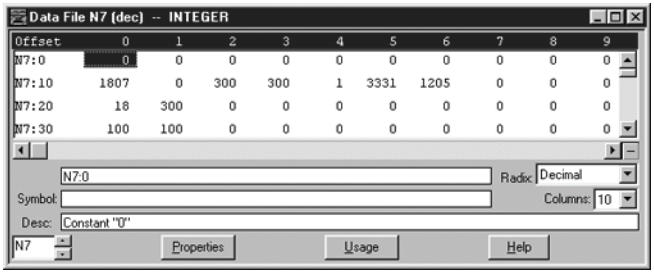


Figure F.1 Example SLC Ladder Logic Program (Continued)



The data table used by the example ladder program is explained below:

Figure F.2 SLC Ladder Example Data Table Values



N7: Address	Name	Example Value (decimal)	Example Value Description
0	Constant “0”	0	Fixed to “0” and used to clear read data on the first scan of the ladder program
10	Logic Status	1807	See Logic Status bit descriptions (Appendix I)
11	Drive Error Code	0	No errors
12	Commanded Frequency	300	30.0 Hz
13	Output Frequency (feedback)	300	30.0 Hz
14	Output Current	1	0.01 A
15	DC Bus Voltage	3331	333.1 V
16	Output Voltage	1205	120.5 V
20	Logic Command	18	See Logic Command bit descriptions (Appendix I)
21	Reference	300	30.0 Hz
30	Pr. 39 - [Accel Time 1] Write Value	100	10.0 Seconds
31	Pr. 39 - [Accel Time 1] Read Value	100	10.0 Seconds

The following screens (Figure F.3 to Figure F.6) provide details of the MSG instructions used in the ladder example:

Figure F.3 Rung 7 Logic Command/Reference Write Message

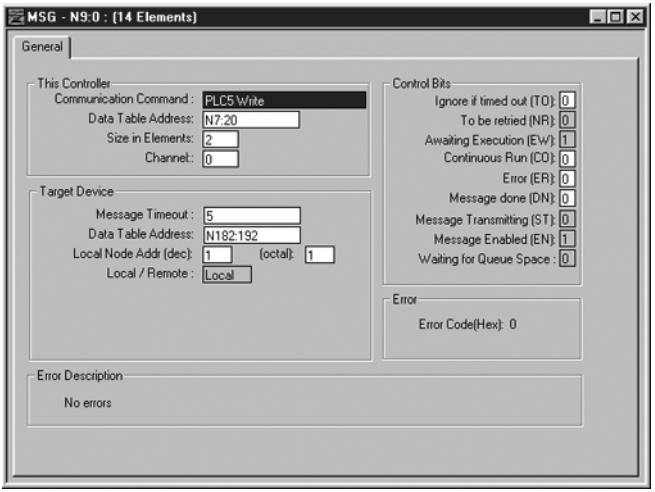


Figure F.4 Rung 9 Logic Status/Feedback/Other Monitor Data Read Message

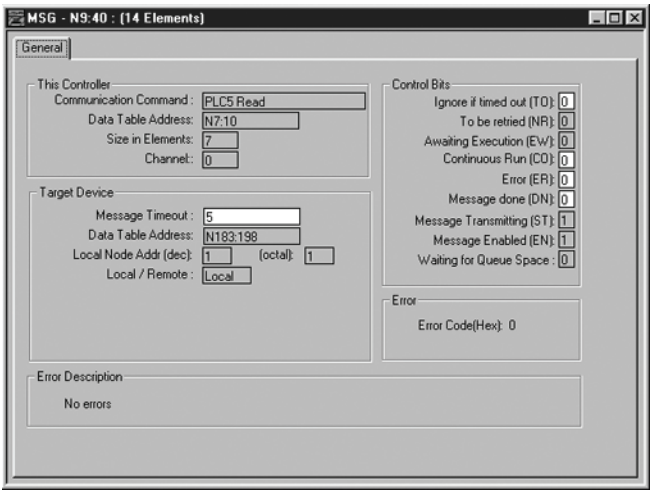


Figure F.5 Rung 11 Parameter 39 - [Accel Time 1] Write Message

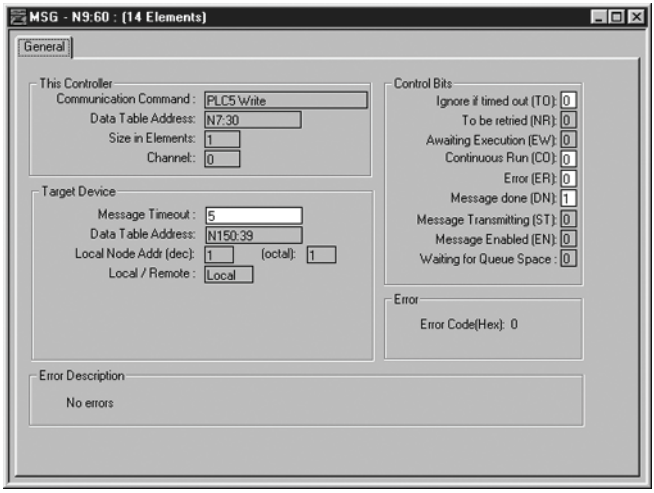
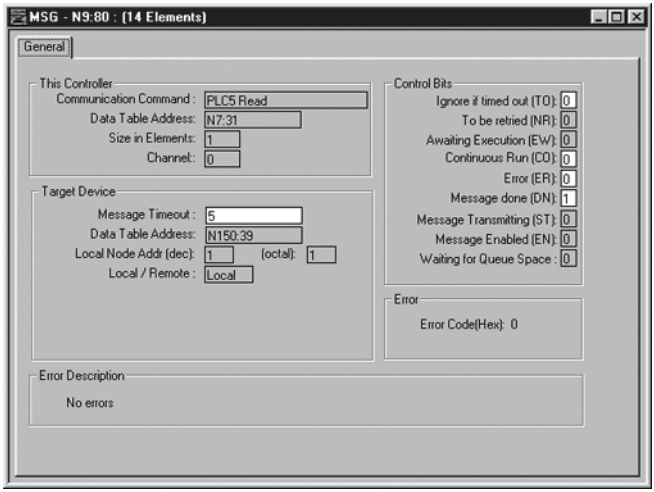


Figure F.6 Rung 12 Parameter 39 - [Accel Time 1] Read Message



Notes:

PLC-5 Example Ladder Program

Appendix G provides information on a PLC-5 example ladder program. The following ladder example demonstrates:

- Writing Logic Command and Reference
- Reading Logic Status, Feedback, and additional monitor data
- Writing/reading Parameter 39 - [Accel Time 1]

Figure G.1 Example PLC-5 Ladder Logic Program

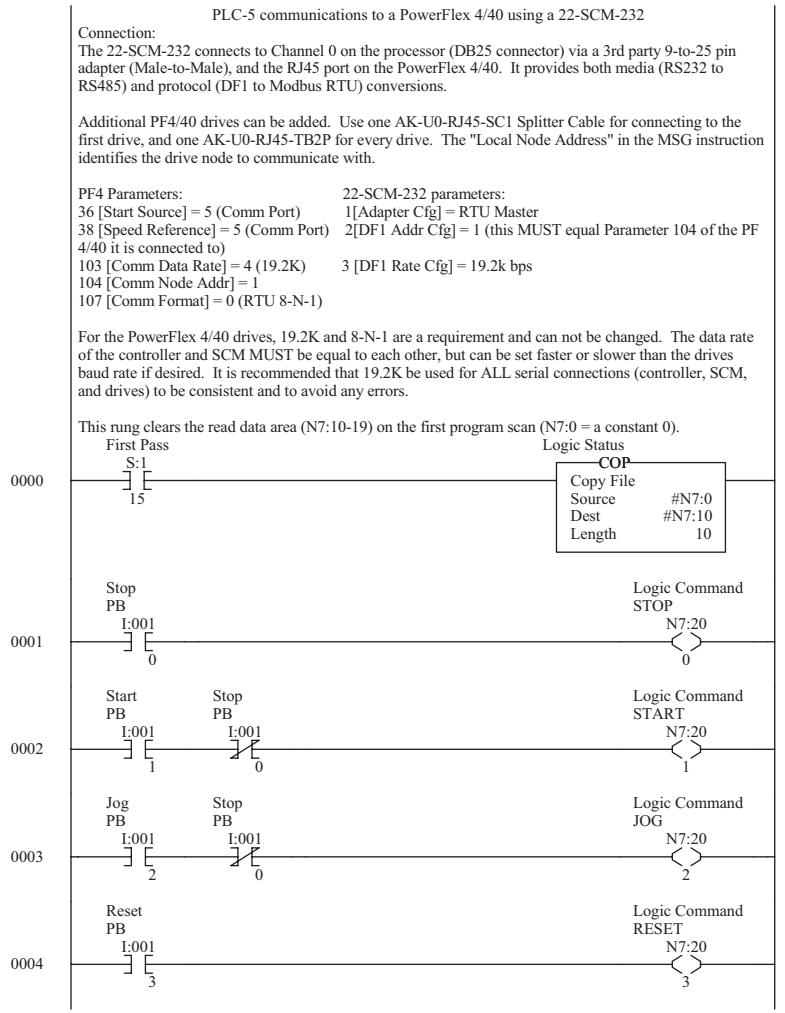


Figure G.1 Example PLC-5 Ladder Logic Program (Continued)

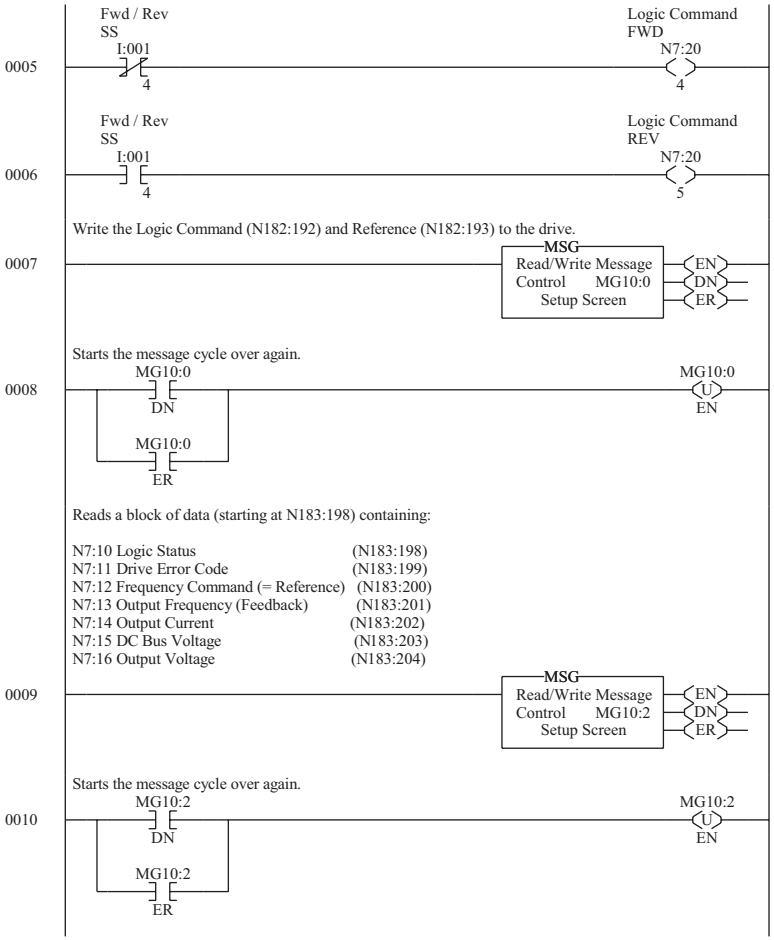
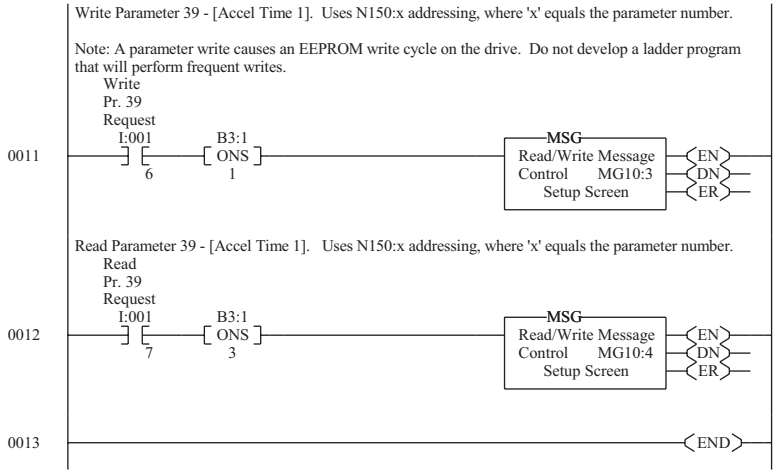
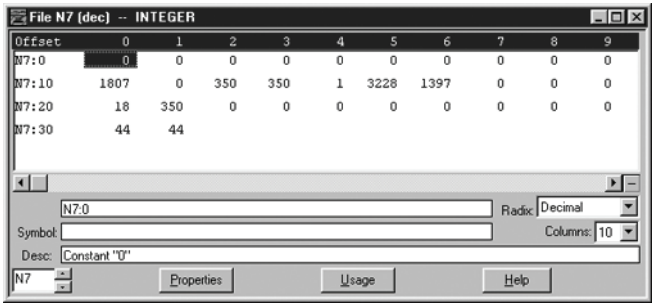


Figure G.1 Example PLC-5 Ladder Logic Program (Continued)



The data table used by the example ladder program is explained below:

Figure G.2 PLC-5 Ladder Example Data Table Values



N7: Address	Name	Example Value (decimal)	Example Value Description
0	Constant “0”	0	Fixed to “0” and used to clear read data on the first scan of the ladder program
10	Logic Status	1807	See Logic Status bit descriptions (Appendix I)
11	Drive Error Code	0	No errors
12	Commanded Frequency	350	35.0 Hz
13	Output Frequency (feedback)	350	35.0 Hz
14	Output Current	1	0.01 A
15	DC Bus Voltage	3228	322.8 V
16	Output Voltage	1397	139.7 V
20	Logic Command	18	See Logic Command bit descriptions (Appendix I)
21	Reference	350	35.0 Hz
30	Pr. 39 - [Accel Time 1] Write Value	44	4.4 Seconds
31	Pr. 39 - [Accel Time 1] Read Value	44	4.4 Seconds

The following screens (Figure G.3 to Figure G.6) provide details of the MSG instructions used in the ladder example:

Figure G.3 Rung 7 Logic Command/Reference Write Message

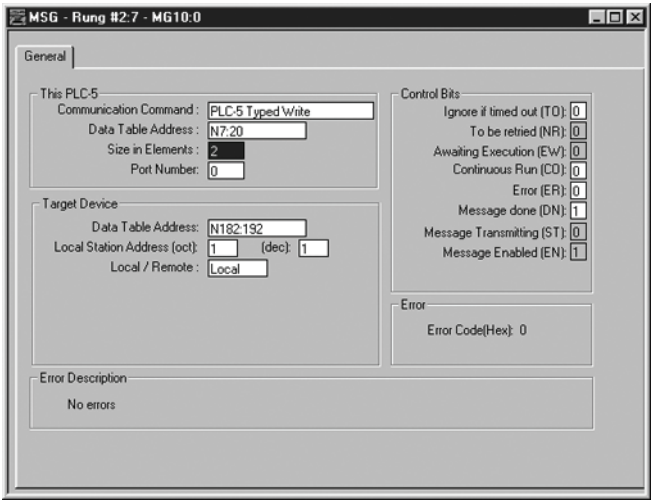


Figure G.4 Rung 9 Logic Status/Feedback/Other Monitor Data Read Message

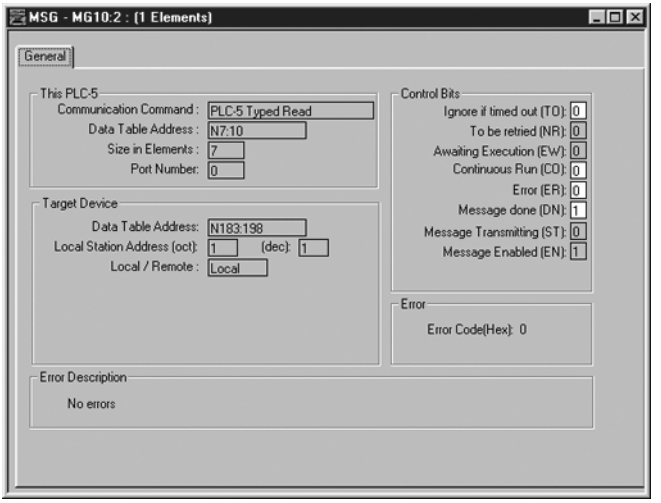


Figure G.5 Rung 11 Parameter 39 - [Accel Time 1] Write Message

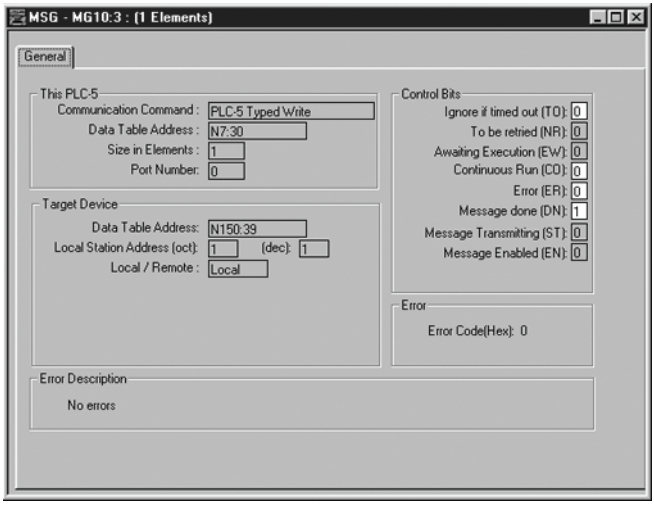
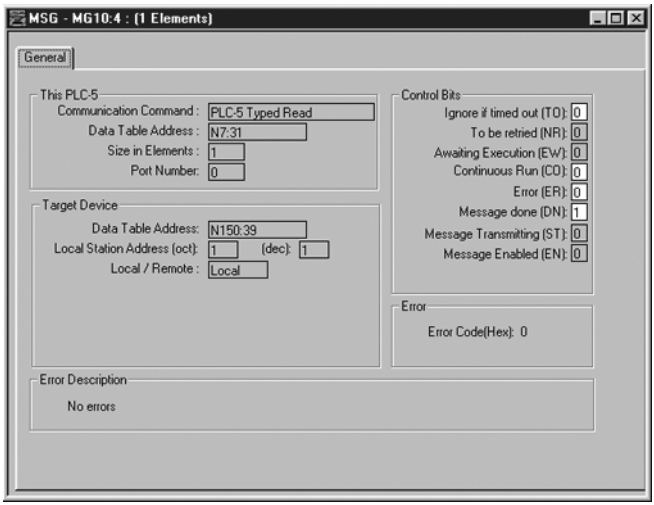


Figure G.6 Rung 12 Parameter 39 - [Accel Time 1] Read Message



Notes:

ControlLogix/CompactLogix Example Ladder Program

Appendix H provides information on a ControlLogix/CompactLogix example ladder program. The following ladder example demonstrates:

- Writing Logic Command and Reference
- Reading Logic Status, Feedback, and additional monitor data
- Writing/reading Parameter 39 - [Accel Time 1]

The example ladder program is for a ControlLogix, but can also be applied to the CompactLogix.

Figure H.1 Example ControlLogix Ladder Logic Program

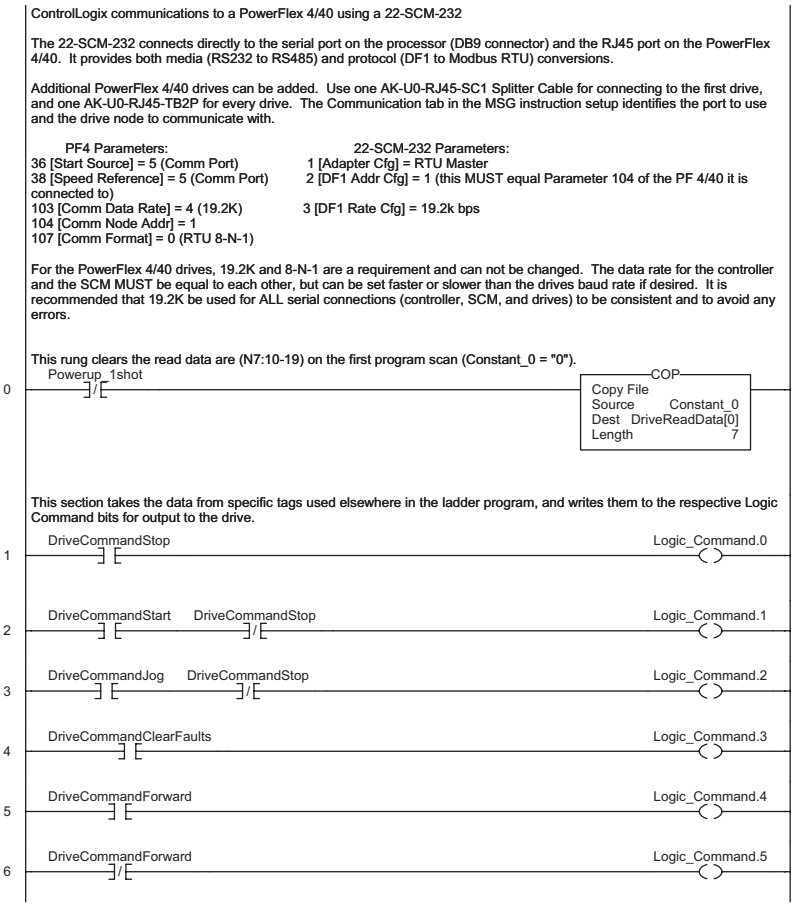


Figure H.1 Example ControlLogix Ladder Logic Program (Continued)

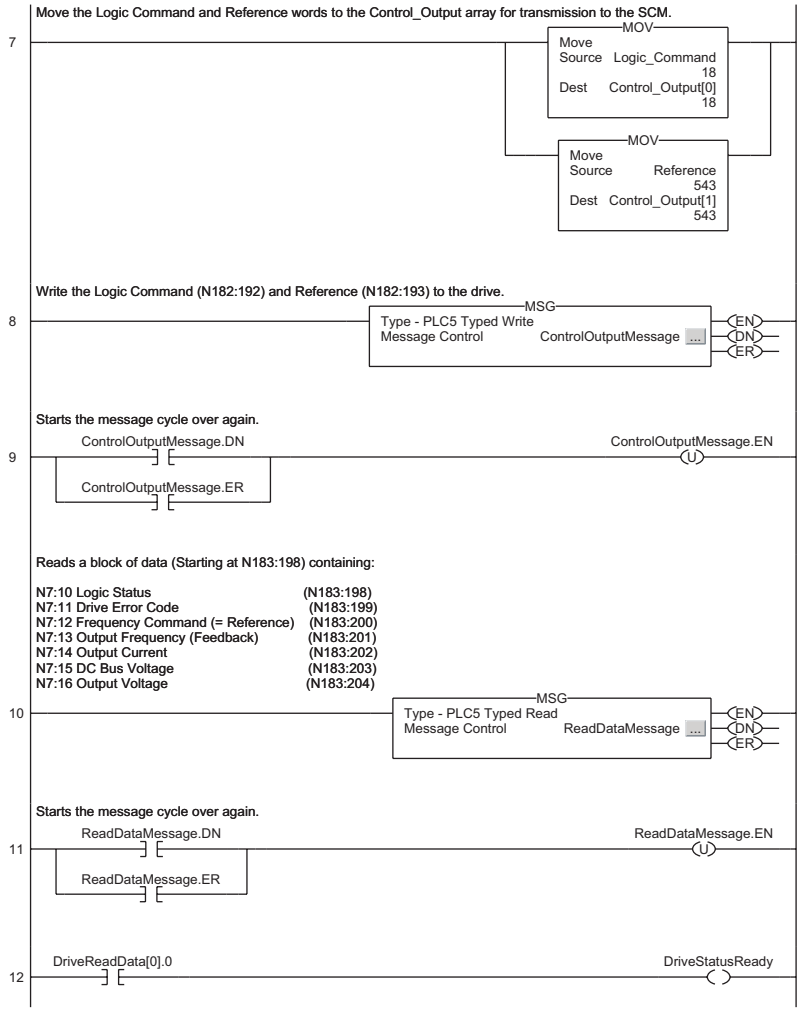
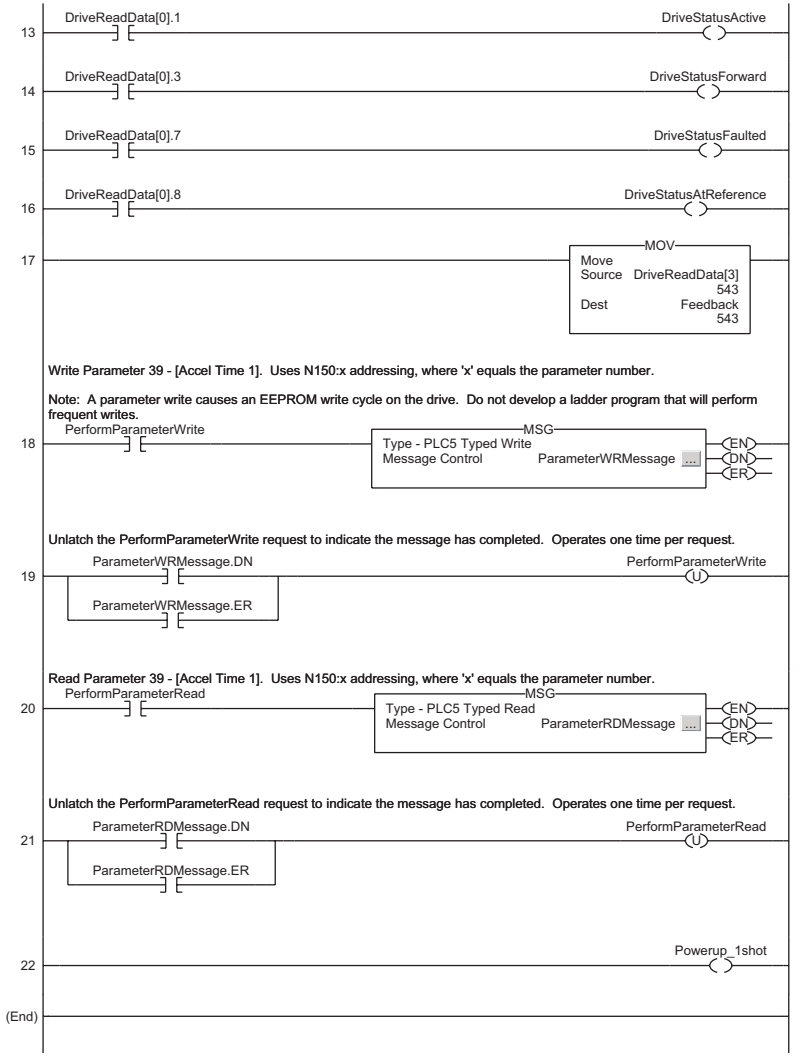
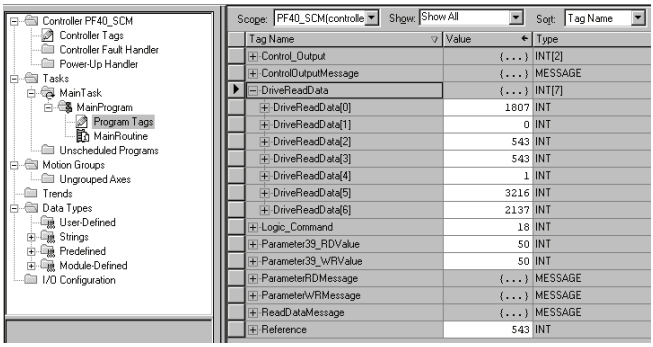


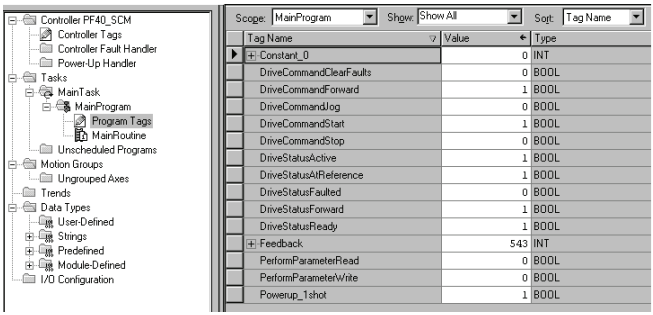
Figure H.1 Example ControlLogix Ladder Logic Program (Continued)



The data table used by the example ladder program is explained below:

Figure H.2 ControlLogix Ladder Example Data Table Values





Tag Name	Description	Example Value (decimal)	Example Value Description
Constant_0	Constant “0”	0	Fixed to “0” and used to clear read data on the first scan of the ladder program
DriveReadData[0]	Logic Status	1807	See Logic Status bit descriptions (Appendix I)
DriveReadData[1]	Drive Error Code	0	No errors
DriveReadData[2]	Commanded Frequency	543	54.3 Hz
DriveReadData[3]	Output Frequency (feedback)	543	54.3 Hz
DriveReadData[4]	Output Current	1	0.01 A
DriveReadData[5]	DC Bus Voltage	3216	321.6 V
DriveReadData[6]	Output Voltage	2137	213.7 V
Logic_Command	Logic Command	18	See Logic Command bit descriptions (Appendix I)
Reference	Speed Reference	543	54.3 Hz
Parameter39_RDValue	Pr. 39 - [Accel Time 1] Read Value	50	50.0 Seconds
Parameter39_WRValue	Pr. 39 - [Accel Time 1] Write Value	50	50.0 Seconds

The following screens (Figure H.3 to Figure H.6) provide details of the MSG instructions used in the ladder example:

Figure H.3 Rung 8 Control Output Message Screens (Logic Command/Reference)

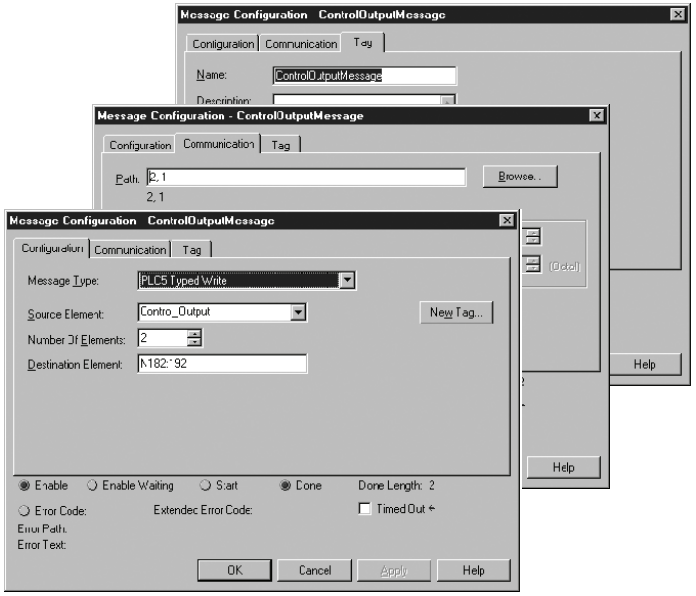


Figure H.4 Rung 10 Read Data Message Screens (Logic Status/Feedback/Other Monitor Data)

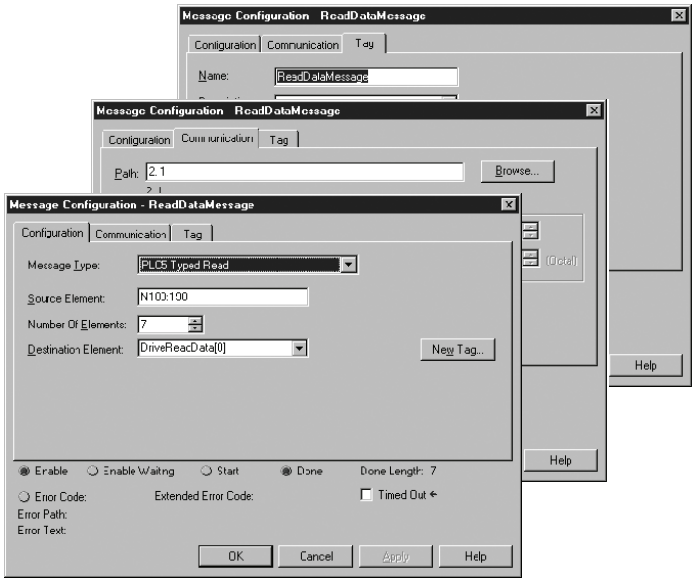


Figure H.5 Rung 18 Parameter Write Message Screens (Parameter 39)

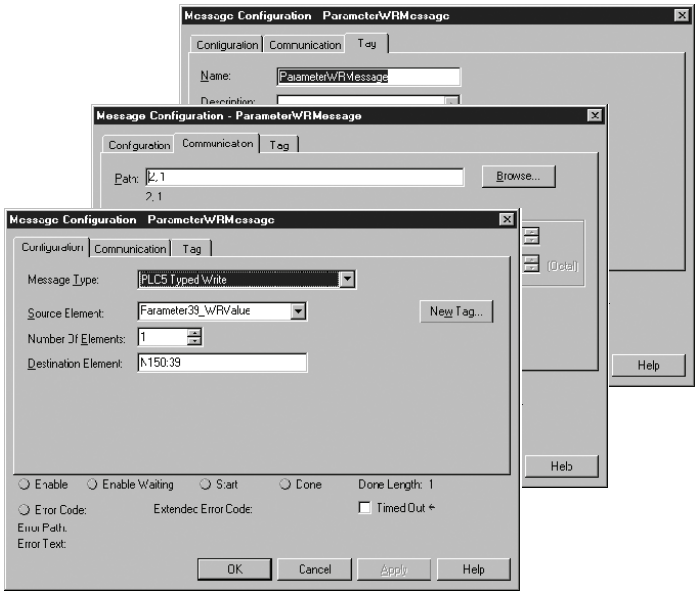
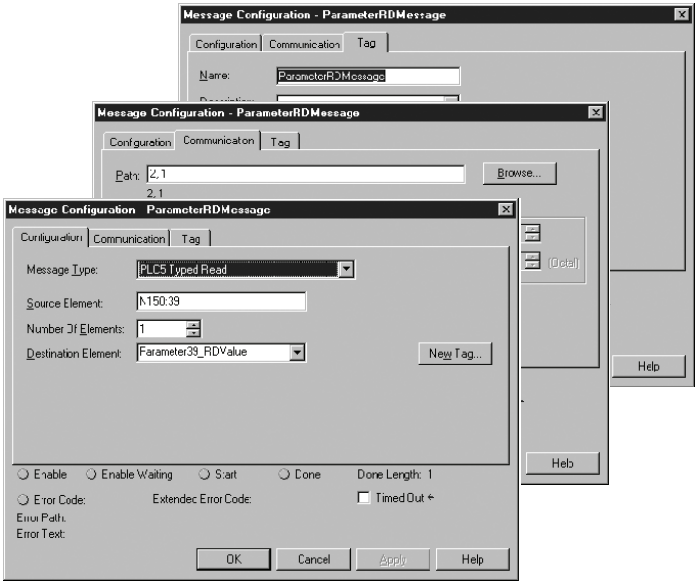


Figure H.6 Rung 20 Parameter Read Message Screens (Parameter 39)



Notes:

Logic Command/Status Words

Appendix I provides the definitions of the Logic Command/Logic Status words that are used for some products that can be connected to the 22-SCM-232 serial converter module. If you do not see the Logic Command/Logic Status for the product that you are using, refer to your product's documentation.

PowerFlex 4 and PowerFlex 40 Drives

Logic Command Word

Logic Bits															Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
															x	Stop	0 = Not Stop 1 = Stop
														x		Start*	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Change Direction (toggle)
									x							Not used	
								x								MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Accel Rate 1 Command 10 = Accel Rate 2 Command 11 = Hold Accel Rate
				x	x											Decel Rate	00 = No Command 01 = Decel Rate 1 Command 10 = Decel Rate 2 Command 11 = Hold Decel Rate
	x	x	x													Reference Select	000 = No Command 001 = Freq Source = Select 010 = Freq Source = Int. Freq 011 = Freq Source = Comm 100 = Preset Freq 1 101 = Preset Freq 2 110 = Preset Freq 3 111 = Preset Freq 4
x																MOP Decrement	0 = Not Decrement 1 = Decrement

* A 0 = Not Stop condition (logic 0) must first be present before a 1 = Start condition will start the drive.

PowerFlex 4 and PowerFlex 40 Drives

Logic Status Word

Logic Bits																
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	**Status**	**Description**
															x	Ready	0 = Not Ready 1 = Ready
														x		Active	0 = Not Active 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
												x				Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm 1 = Alarm
								x								Fault	0 = No Fault 1 = Fault
							x									At Speed	0 = Not At Reference 1 = At Reference
						x										Main Freq	0 = Not Controlled By Comm 1 = Controlled By Comm
					x											Operation Command	0 = Not Controlled By Comm 1 = Controlled By Comm
				x												Parameters	0 = Not Locked 1 = Locked
			x													Digital Input 1 Status	0 = Open 1 = Closed
		x														Digital Input 2 Status	0 = Open 1 = Closed
	x															Digital Input 3 * Status	0 = Open 1 = Closed
x																Digital Input 4 * Status	0 = Open 1 = Closed

*PowerFlex 40 only

A

Application Code

Code that runs in the serial converter module after the boot code calls it. It performs the normal operations of the system.

B

BCC

Block Check Character. An error detection scheme where the 2's complement of the 8-bit sum (modulo-256 arithmetic sum) of all data bytes in a transmission block. It provides a means of checking the accuracy of each message transmission.

Boot Code

Code that runs when the serial converter module first receives power. It checks basic operations and then calls the application code.

C

CRC

Cyclic redundancy check. An error detection scheme where all of the characters in a message are treated as a string of bits representing a binary number. This number is divided by a predetermined binary number (a polynomial) and the remainder is appended to the message as a CRC character. A similar operation occurs at the receiving end to prove transmission integrity.

D

DF1 Protocol

A peer-to-peer link layer protocol that combines features of ANSI X3.28-1976 specification subcategories D1 (data transparency) and F1 (two-way simultaneous transmission with embedded responses).

DF1 Rate

A unit of signaling speed equal to the number of discrete conditions or signal events per second. It is also called "baud rate" or "serial port rate."

DSI

Drive Serial Interface - a modification of the ModBus RS-485 serial communications protocol used by various Allen-Bradley drives and power products.

DSI Peripheral

A device that provides an interface between DSI and a network or user. Peripheral devices are also referred to as "adapters" and "modules." The

serial converter module and PowerFlex 4-Class HIMs (22-HIM*) are examples of DSI peripherals.

DSI Product

A device that uses the DSI communications interface to communicate with one or more peripheral devices. For example, a motor drive such as a PowerFlex 4-Class drive is a DSI product. In this manual, a DSI product is also referred to as “product” or “host.”

DriveExplorer Software

DriveExplorer software is a tool for monitoring and configuring Allen-Bradley products and adapters. It can be run on computers running Microsoft Windows 95, Windows 98, Windows NT (version 4.0 or higher), Windows ME, Windows 2000, Windows XP, and Windows CE (version 2.0 or higher) operating systems. DriveExplorer (version 3.01 or higher) can be used to configure this serial converter module and PowerFlex 4-Class drives. A free version of DriveExplorer Lite is included with the serial converter module. Information about DriveExplorer software can be accessed at http://www.ab.com/drives/driveexplorer.

DriveTools Software

A software suite designed for Microsoft Windows 95, Windows 98, and Windows NT (4.0 or higher) operating systems. To fully utilize DSI products, use DriveTools 2000 version 1.01 or higher. This software suite provides a family of tools that you can use to program, monitor, control, troubleshoot, and maintain Allen-Bradley products. Information about DriveTools can be accessed at http://www.ab.com/drives.

F

Fault Action

A fault action determines how the serial converter module and connected drive act when a communications fault (for example, a cable is disconnected) occurs or when the scanner is switched out of run mode. The former uses a communications fault action, and the latter uses an idle fault action.

Flash Update

The process of updating firmware in the serial converter module.

H

Hold Last

When communications are disrupted (for example, a serial cable is disconnected), the converter module and PowerFlex drive can respond by holding last state. Hold last state results in the drive receiving the last data received via the DF1 connection before the disruption. If the drive

was running and using the Reference from the converter module, it will continue to run at the same Reference.

N

Non-Volatile Storage (NVS)

NVS is the permanent memory of a device. Devices such as the serial converter module and drive store parameters and other information in NVS so that they are not lost when the device loses power. NVS is sometimes called “EEPROM.”

P

PCCC (Programmable Controller Communications Command)

PCCC is the protocol used by some controllers to communicate with devices on a network. Some software products (for example, DriveExplorer and DriveTools 2000) also use PCCC to communicate.

PowerFlex 4-Class Drives

The Allen-Bradley PowerFlex 4-Class family of drives include the PowerFlex 4 and PowerFlex 40. These drives can be used for applications ranging from 0.2 kW (0.25 HP) to 7.5 kW (10 HP). All PowerFlex 4-Class drives implement DSI, allowing them to use the 22-SCM-232 serial converter module.

S

Serial Converter

The serial converter provides an electronic communications interface between any Allen-Bradley DSI product and a computer with an RS-232 port. This converter uses a full-duplex RS-232 DF1 protocol. The serial converter may also be referred to as “22-SCM-232 converter,” “converter,” “DSI peripheral.”

Status Indicators

Status indicators are LEDs that are used to report the status of the serial converter module. There are three status indicators on the converter.

X

Xmodem

Developed by Ward Christensen in 1978, Xmodem is a protocol used to transfer data. You can use the Xmodem protocol to flash the firmware in the serial converter module or a device connected to it.

Z

Zero Data

When communications are disrupted (for example, a serial cable is disconnected), the serial converter module and drive can respond with

zero data. Zero data results in the drive receiving zero as values for command data. If the drive was running and using the Reference from the converter module, it will stay running but at zero Reference.

Numerics

22-SCM-232 converter, see *serial converter*

A

accessing parameters, **3-1**
Adapter Cfg parameter, **B-1**
Adapter Type parameter, **B-3**
adapter, see *serial converter*
agency certification, **A-2**
application code, **G-1**
attentions, **1-4**

B

baud rate, see *DF1 rate*
BCC, **A-1**, **G-1**
boot code, **G-1**

C

cables
  catalog numbers, **2-1**
  connecting, **2-2**
  disconnecting, **2-3**
  selecting, **2-1**
checksum, **A-1**
Clear DF1 Counts parameter, **B-2**
clearing DF1 data, **5-5**
clearing events, **5-4**
Comm Flt Action parameter, **B-1**
communications specifications, **A-1**
compatible products, **1-2**
components of serial converter, **1-1**
configuration tools, **3-1**
ControlLogix example ladder program, **H-1**
converter, see *serial converter*
CRC, **A-1**, **G-1**

D

data bits, **A-1**
DF1
  definition, **G-1**
  viewing data, **5-5**
DF1 Addr Actual parameter, **B-3**
DF1 Addr Cfg parameter, **B-1**
DF1 Packets Rcvd parameter, **B-2**
DF1 Packets Sent parameter, **B-2**
DF1 rate
  definition, **G-1**
  setting, **3-7**
  specification, **A-1**
DF1 Rate Actual parameter, **B-3**
DF1 Rate Cfg parameter, **B-1**
diagnostic items, **5-3**
Diamond status indicator, **5-2**
dimensions of serial converter, **A-1**
DriveExplorer
  definition, **G-2**
  documentation, **P-1**
  free lite version, **G-2**
  using, **3-2**
  web site, **G-2**
drives, see *DSI products*
DriveTools
  definition, **G-2**
  documentation, **P-1**
  web site, **G-2**

DSI
cables, **1-1**, **2-1**
definition, **G-1**
peripheral, **G-1**
products, **1-2**, **G-2**
Duplicate Msgs parameter, **B-3**

E

EEPROM, see *Non-Volatile Storage (NVS)*
ENQs Received parameter, **B-2**
ENQs Sent parameter, **B-2**
equipment
required, **1-3**
supplied, **1-3**
error detection, **A-1**
event queue
clearing events, **5-4**
list of events, **5-4**
viewing events, **5-3**
events
clearing, **5-4**
viewing, **5-3**

F

fault action
definition, **G-2**
setting, **3-8**
fault queue, see *event queue*
faults, see *events*
firmware
parameters in, **3-1**
release, **P-1**
updating, **C-1**
firmware release, **1-1**
Flash update
definition, **G-2**
instructions, **C-1**
troubleshooting, **C-3**
flow control, **A-1**
FRN, **P-1**

H

hold last
definition, **G-2**
setting, **3-8**
HyperTerminal
navigating in, **3-6**
setting up, **3-3**
updating firmware with, **C-3**

I

installing a serial converter, **2-2**

K

keys for navigating in firmware, **3-6**

L

ladder example programs
ControlLogix, **H-1**
MicroLogix 1000, **D-1**
MicroLogix 1200/1500, **E-1**
PLC-5, **G-1**
SLC, **F-1**
LEDs, see *status indicators*

M

main menu for serial converter, **3-6**
manual conventions, **P-1**
mechanical specifications, **A-1**
MicroLogix 1000 example ladder program, **D-1**
MicroLogix 1200/1500 example ladder program, **E-1**

N

NAK Bad Packet parameter, **B-2**

NAK No Memory parameter, **B-3**

NAKs Received parameter, **B-2**

Non-Volatile Storage (NVS)
- definition, **G-3**
- parameters in, **3-1**

P

parameters
- accessing, **3-1**
- list of, **B-1 to B-3**
- manual conventions, **P-1**

parity, **A-1**

PCCC definition, **G-3**

PLC-5 example ladder program, **G-1**

power consumption, **A-1**

power cycling converter, **3-9**

PowerFlex 4-Class drives, **G-3**

products, see *DSI products*

protocol, **A-1**

Q

quick start, **1-5**

R

regulatory compliance, **A-2**

related documentation, **P-1**

removing the serial converter, **2-3**

Reset Module parameter, **B-2**

resetting the serial converter, **3-9**

RX status indicator, **5-2**

S

safety precautions, **1-4**

serial cables, **2-1**, **2-2**

serial converter
- accessing, **3-1**
- components, **1-1**
- connecting cables, **2-2**
- definition, **G-3**
- dimensions, **A-1**
- event queue, **5-3**
- features, **1-2**
- illustration, **1-1**
- installing, **2-2**
- main menu, **3-6**
- parameters, **B-1 to B-3**
- power consumption, **A-1**
- removing, **2-3**
- resetting, **3-9**
- using with ControlLogix controller, **H-1**
- using with hand-held PC, **2-1**
- using with MicroLogix 1000 controller, **D-1**
- using with MicroLogix 1200/1500 controller, **E-1**
- using with PLC-5 controller, **G-1**
- using with SLC controller, **F-1**

serial port rate, see *DF1 rate*

SLC example ladder program, **F-1**

specifications, **A-1**

status indicators
- definition, **G-3**
- operating status, **5-1**
- troubleshooting with, **5-2**

stop bits, **A-1**

T

technical support, **P-2**

terminal emulation software, **3-1**, **3-3**

tools, see *equipment*

troubleshooting, **5-1**

TX status indicator, **5-2**

U

Undelivered Msgs parameter, **B-2**
update, see *Flash update*

V

viewing DF1 data, **5-5**
VT100-compatible terminal, **3-1**

W

web sites, **P-1**, **G-2**

X

Xmodem
  definition, **G-3**
  using to flash firmware, **C-1**

Z

zero data
  definition, **G-3**
  setting, **3-8**

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation, Vorstlaan/Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Publication 22COMM-UM002B-EN-P – March 2003 P/N 305739-P02
Copyright 2003 Rockwell Automation, Inc. All rights reserved. Printed in USA.